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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIII. JANUARY, 1925. PART 1.

Event and Comment.

The Current Issue.

Comprehensive reviews of Queensland's ever-expanding agricultural and dairying industries are among this month's main features. The sugar industry is well covered and some useful notes on the epidemic of Red Rot in M. 1900 Seedling by Mr. Cottrell-Dormer are added. Phalaris grass is discussed in a short note by Mr. Liverseed. Mr. Shelton's main topic for this issue is the necessity for the study of the principles and problems of pig feeding. Mr. White has a note on the "Devil's Claw" (*Martynia lutea*), while Mr. Pollock discusses Nut Grass and methods of eradication. Mr. Scriven's retirement from the Under Secretaryship is the subject of a brief note. Among reprinted matter is an article on contagious pneumonia in pigs and a paper on cold storage of fruit. Some excellent plates show something of the Darling Downs wheatfields and blossoming fruit trees in the Stanthorpe district. The January Journal covers a very wide field and will be welcomed by readers.

The Outlook.

All history holds no parallel to Australia, a continent pioneered and peopled by one vigorous and enterprising race—the composite race of British peoples, English, Irish, Scottish, and Welsh—speaking the same language, possessing the same inspiring literature, inheriting the same great traditions, governed by the same set of ideals, with one flag and one destiny. Practically 100 per cent. British, Australians are free from racial turmoil and other racial difficulties, and, looking round on the world to-day, no people is more happily placed. No people ever had such a virgin wonderland to develop. In climate, fertility, and unmeasured natural wealth, not a tithe of which has been exploited, Australia is particularly well blessed. No people since civilisation dawned ever had a greater opportunity than that in the hands of Australians to-day. Optimism is an Australian characteristic, and why not! The year 1925 opens before us with glowing prospects. The season is bountiful and our products are in clamant demand. Our best brains are bent on better marketing organisation, evidence of a general advance along the road of progress. Everything points to the beginning of a period of unprecedented prosperity, and things generally, particularly in respect to primary production, look very bright. And with rapid and sound development in our primary industries is marching expansion in our secondary enterprises, and consequent extension of our home markets. The outlook cannot be otherwise than cheerful and, to-day, as we take a wide horizoned survey, it is better to be in Australia than anywhere else in the world. It is good to be a citizen of the Commonwealth.

A Ministerial Record.

The Hon. W. N. Gillies, the Minister for Agriculture and Stock, has just completed the record term of five years and four months in the administration of this Department, a term marked by phenomenal progress in agriculture and allied industries within the State. In the course of the thirty-six years since the establishment of the Department there have been no fewer than eighteen Ministerial heads. Mr. Gillies' immediate predecessor was the Hon. William Lennon, now Lieutenant-Governor, who had held office longer than any previous Minister—four years and three months. The Hon. Digby F. Denham was Minister for three years and four months, and the late Hon. D. H. Dalrymple for a little over two years and five months. Mr. Gillies' term as holder of what is now one of the most important portfolios, therefore, constitutes a record. On his entrance on his work as Minister for Agriculture and Stock, Mr. Gillies found twenty-two Acts of Parliament to administer. In the course of his term seven of these have been amended or consolidated and fourteen new agricultural and related measures have been added to the Statute Book. Not only is his term of occupancy of the office a record, but it may be fairly claimed that the five years under review show also a phenomenal record in departmental activity. In the course of that time the cotton industry, practically non-existent a few years ago, has been successfully established and promises to become, like sugar, one of our great basic industries. The systematic organisation of agriculture has become, through the Council of Agriculture and its subsidiary bureaux and notwithstanding the difficulties and consequent necessity for incidental readjustment, a live issue, pulsating full-bloodedly, with the farmers of Queensland. The formation of pools for primary products, of which the Wheat Pool was the successful forerunner, required not a little initiative, courage, foresight, and capacity. Through their operation on sound business lines the primary industries of Queensland are well on the way to solid stabilisation. Other new furrows opened in the field of agricultural development in this State in the course of the period under review include the initiation of schemes for the conservation of grain and fodder; the placing of the co-operative movement among farmers on a sound basis; the protection of banana-growing and its preservation as a white man's industry; action towards the stabilisation of the meat and dairy industries; the Sugar Agreement with the Commonwealth; amendment of the Sugar Cane Prices Acts; liberalising the system of advances to settlers; statutory protection of the poultry industry; improvement of draught horse stock by State purchase of pure-bred sires for service in agricultural districts; protection of the interests of orchardists in respect to pest destruction; closer protection of native birds and animals; extension of departmental scientific services; improved publicity in respect to rural enterprise, conditions and problems by motion pictures and otherwise; and the establishment of a comprehensive agricultural library. As showing the expansion of departmental business during the five years' term figures are illuminative. Expenditure in agricultural and pastoral development within the State increased by 229 per cent.; during the same time the revenue of the Department increased by 333 per cent., while the total amount handled by the Department in respect to both receipts and expenditure increased by 260 per cent. When Mr. Gillies assumed control of the Department on the 10th of September, 1919, the staff enrolment was 389. Since then it has increased to 546, and the additions have been mainly of field and professional officers. Notable additions to departmental personnel include a technical cotton staff, an increase of the entomological staff from three to thirteen, and an instructor in pig raising. The establishment of experimental farms at Home Hill and in the Burnett also meant additions to the technical and field organisation. Closer organisation has been followed by co-ordination of services and an effective liaison with the Queensland University, particularly in relation to biological and pathological problems affecting agriculture and stock raising within the State. The remarkable expansion of the activities of the Department outlined has followed the gradual application of a broad-visioned, statesmanlike rural policy—a policy, as expressed in recent legislation, that has claimed the attention of commentators in other countries and has aroused the interest of farmers and others concerned with agricultural development in every State in the Commonwealth.

THE CHIEF OF THE AGRICULTURAL DEPARTMENT.

RETIREMENT OF MR. SCRIVEN.

The retirement at the end of December of Mr. E. G. E. Scriven from the office of Under Secretary of the Department of Agriculture and Stock meant the severance from the official life of Queensland of one of the most capable and beloved men in the Public Service of the State. Mr. Scriven's retirement had been deferred by the Government more than once, so great was the appreciation of his work and achievement in the Department of which he had the direction as permanent head for twenty years. The completion of his official term was marked by fine tributes in the Metropolitan and Country Press to his personal worth and great work in the service of Queensland.

When first he came into its service, the agricultural work was part of the duties of the Lands Office. In a quarter of a century he has seen its extraordinary growth, and with the help of the always growing staff has directed the development of some of Queensland's greatest industries.

When Mr. Scriven was appointed to this department upon its initiation, thirty-seven years ago, it had a staff of two, one being the Under Secretary (Mr. P. McLean), the other himself. That the staff has grown from its small beginnings to one of over 500 members is, to a vast extent, due to Mr. Scriven's ability, foresight, enterprise, and administration as Under Secretary—a position which he has so successfully held, ever with courtesy and a kindly regard for others, for twenty years. Excluding the present Minister, he has had association with sixteen Ministers. The Department of Agriculture and Stock has thirty-eight Acts of Parliament, while the branches into which the department now is divided include administration, agriculture, agricultural chemistry, cotton, fruit, stock and brands, sugar, seeds and fertilisers, dairying, publicity—including photography—wool, and entomology, not counting the Agricultural Bank, in Brisbane and throughout the State. To administer all these measures required more than a passing knowledge of their provisions. Mr. Scriven's administrative tenure covers more than a quarter of a century in the development of agriculture in Queensland, a period of remarkable agricultural progress.

Some of the principal happenings in that time were the change from the cultivation of soft wheats to the hard wheats now generally grown, the development of Queensland from a wheat-importing to a wheat-exporting State, and improvements in the quality of maize used for planting; initiation of the travelling dairy, and the passing of the Dairy Produce Act, which formed the basis of the great dairying industry as we know it to-day. The growth of the meat export trade has been fostered and the transition of the sugar industry from the plantation system with black labour to the system now organised and followed with such success as a great White Australian industry. Other matters include the establishment of the agricultural college, State farms and experiment plots, and the protection from diseases by legislation of stock, plants, and poultry, and the protection of animals and birds; advances to settlers for the purchase of dairy stock, and the establishment of the Agricultural Bank. Mr. Scriven also has seen the establishment of Central sugar mills, commencing with the North Eton and Racecourse mills at Mackay, the establishment of the sugar experiment stations, and the action which has led to the protection of the banana industry; the protection given to growers by the Pure

MR. ERNEST G. E. SCRIVEN, The Retiring Under Secretary, Department of Agriculture and Stock.

Seeds Act; and the regulation of the sales of fruit so that a buyer shall know the quantity and quality of what he buys. There has also been established the system of instruction in fruitgrowing, and the pools system; fruit marketing organisation, and the Council of Agriculture. He also was prominently associated with the establishment of the cotton industry; the encouragement and help to farmers with less than 1,500 sheep in marketing their wool to the best advantage; the first experiments for the destruction of prickly-pear, for which purpose a board is now required; investigations into blowfly in sheep, fruit fly, bunchy top; and the establishment of tropical agricultural industries.

Mr. Scriven's early days were not uneventful. As a lad of fifteen he was at school in Paris in the days of the Commune in 1871, and was one of those who took refuge in the British Embassy until the Parisians had become sane again, and it was safe to be in the streets. Prior to those exciting days he had lived where he was born, in Shakespeare's town of Stratford-on-Avon. Any Shakespearian will see the connection between the name of Mr. Scriven's home at Yeronga—Shottery—and the village from which Shakespeare wooed and won Anne Hathaway. Mr. Scriven was born in this beautiful Warwickshire spot in 1856. Coming to Queensland as a young man to try his fortune in the new land, he gained "colonial experience" at Eton Vale, Cambooya, which was owned by Sir Arthur Hodgson. He also had experience on the land in North Queensland, and after travelling the State on a trigonometical survey for the Lands Department, he and Mr. Peter McLean formed the staff of the Agricultural Department. In those days the dairying industry was practically non-existent, and, as Mr. Gillies, the Minister for Agriculture, pointed out at a presentation to Mr. Scriven, it now is worth about five million sterling annually to the State. That is only one of the monuments which Mr. Scriven will leave behind him.

Mr. Gillies also pointed out that the relations between the retiring chief and his staff always had been most cordial. This could be ascribed to Mr. Scriven's fairness. A hater of evil, said Mr. Gillies, he always had a soft spot in his heart for the evil-doer; and that inherent sense of fairness to all his officers has often prevented him from extending to individual officers favours to which they thought they were entitled.

All interested in primary production in Queensland will regret Mr. Scriven's departure from the official sphere. Since the establishment of the department there have only been three Under Secretaries—Messrs. McLean, P. J. McDermott, and E. G. E. Scriven—each of whom has performed great service to the State, and Mr. Scriven's name will always be associated with the history of Agriculture in Queensland.

Mr. Scriven Honoured—Minister's Tribute.

On Tuesday, 23rd December, the Minister and the large staff, and many ex-officers of the department, assembled in the Minister's room to bid Mr. Scriven farewell. Incidentally the Minister for Agriculture (Hon. W. N. Gillies) stated that the suggestion had been made that the Government should found a Scriven scholarship at the Gatton Agricultural College, and he heartily subscribed to it.

In presenting, on behalf of the staff, a well-filled wallet of notes to Mr. Scriven the Minister said that he supposed that the occasion was one that would come only once in a lifetime to him. It was with great pleasure that he handed some token of the staff's esteem to the "father of the Agricultural Department of Queensland."

Mr. Scriven started in the department some thirty-six years ago, and then had with him the late Mr. Peter McLean, in a small office in George street. At present the department employed 546 officers, and a great deal of the success it had achieved was brought about by the Under Secretary. The best thing he could say about Mr. Scriven after he had been intimately associated with him for five years—a record for a Queensland Minister of Agriculture—was that he was a man. Nothing better than that could be said about any one after he had finished such a long term of work in the interests of the community. During his term as Under Secretary the department had made great strides, and a great deal of the credit must go to their guest. Even during his (the speaker's) term of office the work done had been phenomenal. On two occasions his term had been extended, and he would have liked to have seen it extended again. Mr. Scriven was retiring on his laurels, and having done that he could retire satisfied that he had done much for his country. He hoped Mr. Scriven would realise the esteem in which he was held, not only by every officer of the department, but by every man in the agricultural industry in the State. Every man on the land in Queensland knew Mr. Scriven personally, by repute, or by correspondence, and he had been a friend to them all.

Mr. E. Graham, who succeeds Mr. Scriven, as Under Secretary to the department, said it was not without a pang of regret that he felt Mr. Scriven's close association with the department was drawing to a close. Mr. Scriven had been the philosopher, friend, and father to many of them, and as well as conducting the business of the department he had borne more than his full share of the domestic troubles of the officers. He thought the department owed a great deal to the energy, foresight, and guidance of Mr. Scriven. They could not forget that he had set a high standard in the department which they would find it hard to maintain. On behalf of the officers of the department generally he extended to Mr. Scriven their best thanks for all he had done for them, and extended to him their best wishes for the future.

Messrs. A. H. Benson (fruit branch), J. C. Brünnich (chemistry), H. T. Easterby (sugar), and J. P. Orr (registrar of primary producers) expressed their felicitations to Mr. Scriven on behalf of the employees of their respective branches. Two old employees of the department who had served under Mr. Scriven, but had since severed their connection with the department, Messrs. Murphy (solicitor), and J. E. England (Main Roads Board), also paid a tribute to Mr. Scriven's sterling qualities as a "boss" and as a man. On behalf of the ladies employed in the department and on behalf of the members of the sports club, Mr. Orr presented Mr. Scriven with a smokers' outfit and a photograph of Mr. Scriven kicking off in the football match, College *v.* the Department.

Mr. Scriven, who was cheered for several moments when he rose to reply, spoke interestingly of the past and dark days of the department, of days when Ministers and Parliamentarians wanted it abolished. That period had passed, he said, and the worth of the department was recognised everywhere. During the past five years the present Government had been very much in sympathy with the department. He felt very keenly the severance of his connection with the department, as he had an intimate acquaintance not only with its work but with the men and women who had helped to make it what it was.

His long association with the department had been a happy one, and if he could do anything to help his successor, he would be only to pleased to do so. "It is very hard to leave you," concluded Mr. Scriven. "I thank you."

The last day of Mr. Scriven's official term was marked by a large valedictory gathering at the Hotel Cecil representative of every branch of the department.

THE NEW UNDER SECRETARY.

APPOINTMENT OF MR. GRAHAM.

Mr. A. E. J. C. K. Graham has been appointed to succeed Mr. Scriven as Under Secretary of the Department of Agriculture and Stock. Mr. Graham was born at Wagga Wagga, in New South Wales, forty-eight years ago. Following his school days and for more than thirty years, he has been continuously associated with agriculture and stock matters, and has made a study of both, specialising particularly in dairying. He was educated at the public school and the Grammar School at Bega, on the South Coast of New South Wales, and passed the public service examination. However, he engaged in the popular pursuit of that noted district—dairying—simultaneously entering upon the study of the theory of agricultural and dairying chemistry. He was the manager of an important butter and cheese factory company when only twenty-one years of age, and after successfully filling that position for several years became instructor in dairying at the Queensland Agricultural College at Gatton. There he taught dairying from both the practical and scientific sides,

and lectured on animal husbandry, live stock (breeding and feeding), the growing of fodder crops, dairy factory hygiene, and milk and cream testing; and the practical work included pasteurisation, the propagation of lactic culture, and the manufacture of butter and cheese. From Gatton he came to the head office of the department, where he has acted for sixteen years as advisory officer on all matters relating to dairying, and has held the office of Director of Dairying and Cold Storage. He was for years personally responsible for the administration of important Acts bearing on dairying, and practically was the framer of the Dairy Produce Act of 1920—an Act since used as the basis of similar legislation overseas. He is a member of the Australian Dairy Council and the State Dairy Board, and of the Council of Agriculture as a Government nominee. He has done much important work for the Government in the selection and purchase of pedigree stock. He was chairman of the committee appointed by the Council of Agriculture, which prepared and published "The History of Dairying in Queensland," and he has been a prolific writer on dairying, pig raising, and other matters bearing on agriculture and stock. He has also carried out the duties of examiner of students in dairying subjects. Mr. Graham's comprehensive knowledge of the Acts administered by the Minister, and his personal knowledge of the agricultural districts of Queensland, and its conditions of soil and climate generally will be particularly valuable in his new office.

THE ASSISTANT UNDER SECRETARY.

APPOINTMENT OF MR. ROBERT WILSON.

Mr. Robert Wilson, who has been appointed to the new position of Assistant Under Secretary, was born on the Logan River, where his father was engaged in cotton-growing and in cane planting and sugar manufacture. He entered the Department of Agriculture on leaving the Brisbane Grammar School, and has served in every branch of that department, incidentally holding the secretaryships of the Australian Rust in Wheat Conference, Interstate Conference of Ministers of Agriculture, annual agricultural conferences held in different parts of Queensland between 1897 and 1903, the Board of Advice under the Diseases in Plants Act, 1897 to 1899, the Meat and Dairy Board from 1905 to 1911, the Royal Commission on Central Sugar Mills, 1910 to 1911. In these and other similar positions he visited on numerous

occasions to deal with agricultural and pastoral matters practically the whole of the farming portions of the State.

Mr. Wilson, who served in the field with the Mobile Field Artillery (47th 18-Pdr. Battery, A.I.F.), was on the Somme during the winter of 1916-17, was in the autumn operation in the Ypres area in 1917, and participated in the general advance which commenced on the memorable 8th August, 1918, and ended with the armistice on 11th November of that year.

He is well known in amateur sporting circles. For many years he has been associated with rowing in Brisbane, and secured his champion eights in 1909. At different times he was treasurer, secretary, and captain for the Commercial Rowing Club, and selector for the Queensland Rowing Association. He was equally interested in cycling, and was treasurer of the Queensland Cyclists' Union and captain of the Brisbane Safety Bicycle Club. He won the championship of the latter club in 1903 and 1904, the road team premiership of Queensland in 1900, the Grammar School old boys' bicycle races in 1898 and 1900, and was second in the 5-mile amateur championship of Australasia in 1900.

QUEENSLAND AGRICULTURE IN 1924.

By H. C. QUODLING, Director of Agriculture.*

Increase in Land Settlement.

In last year's report reference was made to the initiation of a system of inter-departmental work between officers of this and other Government departments in connection with the land settlement scheme in the Upper Burnett and Callide Valleys. During the past year it has been my privilege to act on a Land Settlement Committee which dealt with upwards of 2,000 applicants; also to assist in preparing information on agricultural possibilities for an informative publication dealing with the areas in question. Under the above scheme alone, several hundred new settlers have been added to the State's quota within the last six months.

Statistical Records of Production.

Ample necessity exists for an early survey of the existing system of collecting statistical returns dealing with agricultural production, with a view to the organisation of a scheme of registration of persons engaged in its different branches; the recording of the acreage under each crop or about to be put under crop; the furnishing of regular progress reports on crops and of authentic returns of primary produce generally.

Clydesdale State Stallions.

Since the inauguration of the Stallion Board, consisting of four other persons and myself, appointed to administer matters connected with the six Government entires purchased with the object of improving the State's draught horse stock, the season was entered upon in October last and completed early this year. The public so fully supported the scheme that many districts could not be catered for. There is ample indication that more sires could be very profitably employed.

Wembley Exhibition.

My appointment under the State Commission as Chairman of the Agricultural, Horticultural, and Viticultural Committee called for a good deal of detailed organisation work, in order that the State's primary agricultural products might receive proper attention and take their place in the big Commonwealth display. In this connection I wish to record the fact that the committee and secretary were brother officers in the Department, whose combined efforts resulted in the assembling and preparation of what must be regarded as a very creditable collection of products.

Royal National Exhibition.

In August last a comprehensive display was staged in the Departmental Court, when full representation was made of the work and activities of a number of officers engaged in instructional and technical matters associated with primary production. It is fitting at this time to draw attention to the fact that the officers concerned in making these annual displays are in reality doing a great national work, by educating not only those who depend on the land for a living, but are also educating others in the realisation that scientific food production is one of the most noble of occupations on which obviously all others depend.

Council of Agriculture.

As one of the Government nominees on the Council and a member also of the Agricultural Committee, a part has been taken in dealing with a number of problems confronting primary producers.

The Past Season and its Effect Generally on Crops.

For the first six months of the year the season was not at all satisfactory from the standpoint of production, owing to the rainfall being much below normal, but for the second half there was ample rain, admittedly too much at times, particularly for cotton, which, when not already checked by a developing crop, made a super-abundant growth of foliage and wood, the general effect of which militated against the plants' capacity to produce anything like a normal supply of cotton.

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* In the last Annual Report of the former Under Secretary (Mr. E. G. E. Scriven) to the Minister (Hon. W. N. Gillies) for submission to Parliament.

The wheat crop, for which good preparation had been made, proved most disappointing. Generally speaking, the rain in the winter and early spring months was light and crops correspondingly so, the grain not reaching its usual standard of quality. Barley and oat crops were also for the greater part partial failures. The production of canary seed, which had experienced a setback for two years owing to the large carry-over from the immediately preceding crop, again received a check, so much so that merchants found it necessary to import stocks to meet current requirements.

It will be noted from the foregoing remarks that producers everywhere, excepting perhaps those in certain favoured districts on the North Coast, had much to contend against, and were naturally jubilant when summer brought with it bountiful rains. Everywhere, great activity was shown in sowing seed of summer-growing crops, both for fodder and grain, a bumper planting being made of maize, a good deal of attention also being paid to pumpkins, peanuts, sorghums, and millets. The effect of the excellent growing season was expressed in most extraordinary yields of maize. Rarely, too, has the whole face of the country been clothed with such a superabundance of natural pastures.

In the North it was freely stated that the dry winter and spring of 1923 had not had a parallel for a decade, and that stock losses were unusually heavy. Similarly to Southern Queensland, a heavy planting of maize was made when favourable summer rains occurred, the high prices ruling for grain at time of sowing seed acting as one inducement; and the second incentive to put as much land as possible under crop was the proposed scheme for the erection of storage silos at Atherton, Tolga, and Kairi. Greater need exists on the Atherton Tableland for an up-to-date drying, cleaning, and storage plant than perhaps elsewhere, but the fact remains that maize-growers in general, to reap a maximum advantage and a fair reward for their labour, must in their own interests evolve a more scientific method of storage, market stabilisation, and control.

Cheapening the Cost of Production of Maize.

Two years ago reference was made to the inventive genius of Mr. George Free, of Nobby, who had designed, constructed, and tested a complete maize harvester, capable of effectively harvesting, threshing, and bagging a ripe crop of grain in the field. Since then Mr. George Hand, of Toowoomba, patented a maize reaper thresher which promises to be a most efficient machine. These inventions mark a new era in cheapening the cost of production of the State's principal cereal.

This unique system of harvesting, applicable wherever maize readily ripens on the stalk, ranks in efficiency and accomplishment of purpose with other remarkable Australian inventions, notably the sheep-shearing machine, the stump-jump plough, and the "complete" wheat harvester.

Improvement in the Type and Yield of Queensland Maize.

Intimately wrapped up with the economics of maize production is the all-important question of establishing and standardising certain types of sound, good-keeping, marketable grain to meet the varying conditions of different districts; the maintenance of these types; and the imperative necessity of producing grain of high productivity, regularly, and in sufficient quantity to gradually raise the average and aggregate yield of the State. Briefly, these represent the objectives aimed at in the scientific system of seed maize improvement which the departmental maize specialist (Mr. C. McKeon) has in hand. Each year's results at least mark in some measure certain improvements gradually being effected by a painstaking system of selection, calculated to eliminate undesirable characteristics common to such a cosmopolitan plant as maize, whose seed so readily suffers deterioration from pollen, foreign to the particular botanical characteristics which a scientific investigator may be attempting, by selection, to fix.

It is gratifying to be able to report that good results have been attained in the production of supplies of excellent seed, sufficient in the aggregate to plant several thousand acres of maize. All this grain is selected by men trained to the work, and when cleaned and graded is offered for sale. In this way growers can readily benefit, and voluntary evidence of this fact is forthcoming through maizegrowers from time to time of the many excellent yields of grain obtained by using departmental stud seed.

Apart from a number of minor trials incidental to progressive seed improvement work, the several varieties grown under field conditions comprise Improved Yellow Dent, Star Leaming, Reid's Yellow Dent, Golden Beauty, Funk's Yellow Dent, and Funk's 90-day, the aggregate area of the plots being 137 acres. Loss was occasioned, through flood-waters and a heavy windstorm, of what promised to be three very

high-yielding crops. Improved Yellow Dent was the highest yielding variety—90 bushels per acre—four times the average yield of the State. Other varieties also furnished good results. Funk's 90-day made the rather remarkable yield, for a small-seeded, quick-maturing variety, of 60 bushels per acre, whilst Star Leaming returned 78 bushels, admittedly an excellent yield for a four months' variety. These figures indicate that high production may be regarded as an inherited characteristic, a fact calculated to play an important part in any systematised effort, such as the Department has in hand, to improve the status of the maize industry.

Maize Cleaning, Drying, and Storage Plant.

The three-unit plant in course of erection at Atherton, Tolga, and Kairi marks a forward move in connection with the handling and marketing of maize on the co-operative principle, these silos being the first of their kind in the Commonwealth.

STATE FARMS—ROMA.

Although the Maranoa district, in which this farm is situated, passed through a very trying time, particularly from July to November, much valuable work was accomplished in respect to wheat improvement and the testing of new strains and varieties under dry conditions, a factor which must be taken into consideration in the selection of wheats calculated to meet the somewhat exacting requirements associated with the varying climatic conditions experienced over a series of seasons in different parts of the State.

Crop yields this year were lower than usual, as only 350 points of rain were recorded from July to November, the reduced yields being a result, more or less of a remarkably dry August, in which month only one point of rain was registered.

Fallowing a Safe Practice.

A 30-acre field fallowed in 1922 produced 15 bushels per acre; this particular crop was most promising up to a certain stage, but insufficient moisture at a critical time spoilt the prospect of a heavy yield.

In this connection it is of interest to note that in 1918 a yield of 24 bushels per acre was obtained from the same field when the rainfall for the six months of the cropping season amounted in the aggregate to only 196 points.

Wheat Breeding.

In the wheat-breeding plots over 450 separate rows were sown with different plant selections. An aggregate of 85 small propagation plots were also sown with standard varieties and new strains of wheat resulting from previous cross-breeding and selection work, the tests proving of considerable value in the progressive scheme of wheat improvement.

In the field, 30 varieties of wheat consisting of a few standardised district types and the major portion of new unnamed crossbreds were grown in quarter-acre blocks for comparative purposes, and as a source of future seed requirements. Field crops, from which pure seed supplies are drawn for distribution throughout wheat-growing districts, were represented by seventeen varieties ranging from 2 up to 30 acres in area each.

Thorough Cultivation Essential.

In reviewing the season's operations, embracing fertiliser, cultural, and variety tests, it was demonstrated that the best results were associated throughout with early worked and fallowed land.

General Plant-Breeding Work.

Good progress was made with several branches of work, notably barleys, citrus fruits, vines, and cowpeas. White ants and dry weather, however, were responsible for some losses of seedling crossbred vines planted out last spring.

The Vineyard.

Notwithstanding the dry season, the grape again showed itself to be an excellent crop for the deep sandy soils of this district of the varieties tested here, Gordo Blanco, Muscat Hamburg, Doradilla, Ladies' Fingers, Grand Turk, Belas Blanc, and Muscat Beaume proved to be the best varieties for the district and the most suitable commercial kinds.

Citrus Orchard.

The crop was affected throughout by the lack of subsoil moisture. Mediterranean Sweets, Washington Navels, and Jaffas did the best. Lisbon lemons were unsatisfactory, and cannot be recommended as a commercial crop on the light sandy soils, unless supplies of water for irrigation are available.

Date Palms.

Only about two out of the four dozen palms imported from Algeria will survive; the vitality even of these latter is low, notwithstanding constant attention in trying to save them.

Olives.

The trees find a congenial home in the West and rank in hardihood with the vine.

Cotton.

Fertiliser and plant-spacing tests were undertaken. Growth was too luxuriant during February and the crop was a failure. Seed selections were made from a few special plants for future use.

Miscellaneous Plants.

Sudan grass seed selection work was continued with a view to the selection of special plant types suitable for Western conditions. Several new legumes, millets, &c., from Manchuria were tried out, and one or two promising varieties will be persevered with. Florida Bunch peanuts were affected by the dry weather and did not fill well.

Seed selection work with grain sorghum Feterita was continued with satisfactory results.

HERMITAGE.

Wheat Propagation Work.

This year's work provided principally for a number of trials with varieties emanating from Roma State Farm. Previous seasons' trials furnished valuable data regarding rust resistance and the suitability of certain improved types to the heavier soils common to the Warwick-Killarney district. In this latter respect, Roma Red gave a return of 40 bushels of grain per acre. This year, however, the season was altogether against the wheat crop making anything more than a most indifferent growth, with the result that the returns were practically nil.

Summer Crops.

Although no rain of any material benefit fell until 14th January, efforts were concentrated on the production of fodder and grain crops. In this connection, the following areas were put under crop:—Maize (70 acres) for seed purposes; saccaline (30 acres) for ensilage; Sudan grass (23 acres) for seed and forage; sorghums and millets (20 acres) for forage and seed.

All crops sown before the end of the year furnished only light returns. Saccaline yielded, on an average, 18½ tons of green fodder per acre; 120 tons of saccaline were chaffed and elevated into the silo, and about the same quantity stacked.

The maize crop made excellent growth, and, although not ripe enough to harvest (30th June), there is every promise of a good yield, estimated at 1,000 bags, from the field of 70 acres.

Sheep.

The small flock, upwards of 300 "longwool" crossbreds, suffered to some extent from the long spell of dry weather, resulting in a loss of a small percentage of breeding ewes, also lambs.

Cereals, 1924.

Fifty acres of land was prepared, ready for sowing with special varieties of wheat and another twenty with barleys, for seed purposes. Another 10 acres will be planted with *Phalaris minor*, a grass which has now been thoroughly tried out at this farm, and can be well recommended for grazing purposes during the winter and spring months on the Downs.

GINDIE.

Stud Stock.

The year's operations in carrying on the breeding of Beef Shorthorn cattle, Suffolk Punch and Clydesdale horses, were generally satisfactory, the rainfall for the last twelve months, 20.68 inches, proving sufficient, particularly during the summer months, to ensure a strong growth of natural grasses, with the result that, at time of writing, all stock are in excellent condition.

An exchange of Suffolk Punch sires with the Kairi State Farm was effected, this course being necessary to carry on line breeding with the progeny of the imported sire brought in the first place to Gindie. One excellent two-year-old colt was sold for use in Southern Queensland. The transfer of nineteen Clydesdale females, a stallion, and one colt foal from Gatton to this farm will be sufficient to form the nucleus of a small stud. The change of country has already effected an improvement in the appearance of the animals.

Beef Shorthorn Stud.

Systematic breeding and selection work has been carried on, with the result that 133 purebred females now form the main breeding herd, with another 72 choice heifers coming on. Excellent results are expected from the employment of the two high-class sires, Gindie Duke of Beaufort 2nd and Grand Duke of Oxford 56th. These animals and several stud females recently won a number of prizes at different shows, which in itself tends to make the Gindie cattle popular with persons looking for sires to use for improving their herds.

Development Work.

Throughout the year attention was paid to development work associated with the better handling and management of the different stud stock on the place, in the way of fencing, yards, water supply, additional cultivation paddocks, and fodder conservation. Wheaten, oaten, and bush hay and ensilage were stored, upwards of 100 tons being saved during the season.

Prospects generally are good, and the young animals being bred here are of a good class, calculated to play their part in the improvement of the district's stock.

WARREN.

Development and Experiment Work.

During the year some 50 acres of new land was cleared, and the major portion broken up, for the purpose of instituting a series of field crop trials which would not be influenced by previous cropping arrangements. In this instance the trials embraced a number of winter fodders, singly and in conjunction with legumes selected specially for use by milch cattle.

Special attention was paid also to the production of summer fodder for ensilage (saccharine sorghum) and grain (grain sorghums), with the result that heavy yields were obtained in each instance.

Two 100-ton reinforced concrete silos were filled. Sudan grass from a 12-acre field was cut and cured into hay and stacked.

Ayrshire Stud.

Systematic testing of animals was continued with a view to the segregation of the more highly productive strains. The practice of sending young heifers, bred at Warren, to Gindie to grow and develop, is having a marked effect. The herd has now become very uniform in type, and numerically strong enough to permit of the sale of a number of animals. A representative team of Ayrshires exhibited at the Rockhampton show was favourably commented on by the judge.

Berkshires.

A very active demand was experienced for young pigs of both sexes. Extra accommodation in the way of housing and yards was completed to provide for additional animals used for breeding purposes and their progeny. Fresh blood was introduced (two boars and four sows) from Southern breeders, some of the animals having won prizes in strongly competitive classes at the Easter show in Sydney.

Cochineal Insects.

A supply of these insects was obtained from the Commonwealth Prickly-pear Station at Westwood, for use on pear growing on a creek bank alongside a portion of the farm. Scattered pear on the farm lands was successfully treated with Roberts's Improved Prickly-pear Poison.

Rural Training.

Classes formed with about twelve senior boy scholars from the Stanwell State School have been carried on weekly. Special instruction has been given in saddlery, tinsmithing, milk and cream testing, seed testing, stock judging, and general agriculture. The head teacher of the State school invariably accompanies the pupils, and is co-operating loyally in the scheme of education initiated at this farm, in which both pupils and parents are now most interested.

KAIRI.

The past season proved to be one of the most adverse in the history of settlement on the tableland. The winter, spring, and early summer were exceptionally dry; heavy frosts continued throughout the winter right into mid-September.

Monsoonal rains were late. In some localities the maize crop, although affected by the want of moisture in the case of early planted corn, eventually made good progress, with the result that the district crop is expected to produce about 20,000 tons of grain, which this season will be better cared for than formerly, as large storage silos and drying plants are in course of construction.

New Cultivation Land.

Another 30 acres were added to the cropped area and put under maize. About 5 acres were stumped and broken up to extend cultivation areas attached to the piggery section.

Main Crops.

Crops raised during the season:—Maize (grain), maize (green fodder for silos), sugar-cane, sweet potatoes, and pumpkins amounted to 50, 140, 120, 30, and 90 tons respectively.

Minor Crops.

Huban clover, that much-advertised plant in the Southern States, grew luxuriantly; repeated tests, however, as a fodder proved it to be very unpalatable to stock, so much so that it is not worth while cultivating the plant in this locality, where there is a wide range of more suitable fodder to choose from for stock.

Kikuyu Grass.

This South African variety thrives excellently here, proving resistant to frost and drought. It is not, however, a grass to be carelessly introduced to cultivation paddocks.

Velvet Beans.

Trials of three recently introduced varieties proved them to be heavy croppers.

Sugar-Cane.

Varieties raised specially for use in sugar districts on the tropical coast have done well; a keen demand for these canes has been maintained.

Stud Stock.

Jerseys and Illawarra Shorthorn cattle have done well. The former breed is becoming increasingly popular. Animals, either bred on the farm or from farm-bred stock, have done well in the different show-rings and herds on the tableland.

Berkshire Stud.

The establishment recently of an up-to-date bacon factory revived interest in the farm stud, and a keen demand has again set in for purebred animals to improve the district stock.

Present indications point to the need for providing more accommodation for breeding stock and additional cultivation paddocks to grow suitable crops for their maintenance.

Improvements.

Boundary and subdivisional fencing, water supply, pig shelters and runs, and other minor improvements to the value of over £500 have been carried out during the year, all contributing to the more effective working of this institution.

HOME HILL.

The manager's remarks in connection with the work of this farm are as follows:—

"Although sugar-cane comprises the bulk of the produce raised, the object of growing so much cane (746 tons) is to take advantage of the area available to make the farm as nearly self-supporting as possible, whilst conducting experiments with other crops not usually grown in the district. Irrigation and manurial tests, however, are being carried out in connection with sugar-cane that promise to be of great value to those who are not in a position to take the risk and expense of experimenting along new lines; so for that reason alone the principle of having a staple crop of known value is justification for growing cane on this farm in bulk. This has another important aspect—namely, the recording of actual costs of production in accordance with the requirements of the Sugar Cane Prices Act, and for which the average canegrower can spare very little time, although it is, in an economic sense, of absolute necessity when the industry as a whole is being criticised or legislated for.

Sugar-Cane and Irrigation.

"Of the 746 tons 2 cwt. of cane produced, 473 tons 8 cwt. was 'plant' (25 acres), and 272 tons 14 cwt. 'ratoon' (22 acres).

"Only 2.08 inches of rain fell between 1st January and 31st March last year, and, although artificial water supplies were maintained in the soil, equal to 6 inches per month, the absence of the regular wet season humidity in the atmosphere was a drawback that even irrigation failed to remedy."

Comparative tests between three methods of applying water to standard Badila cane gave the following returns per acre:—

	Tons.	cwt.
Plot 1.—Local method	35	16
Plot 2.—Watered between rows	28	6
Plot 3.—Hawaiian (along the rows) ..	60	7

Top-rot affected the returns from No. 2 plot.

In summarising his observations on irrigation, the manager stated:—

"Watering operations during the past twelve months indicate that the systems usually adopted throughout the district, and which have all been tried out at the State Farm, are mostly open to improvement. The best results from the application of water were obtained when the flow of water through the crop was made as short as possible and brought close to the root systems.

"This is the essence of the Hawaiian system, outlined by Mr. Easterby for this farm three years ago, and which has given excellent results even with modifications to suit its application commercially.

"A condensation of the various experiments carried out during the past year, which were to a great extent guided by the results of the first year's series of experiments, show that the Hawaiian system, even when applied to long rows of cane, gave better and cheaper results than any other. For a given quantity of water raised the extra area served by the Hawaiian system of distribution ranged from 15 to as much as 24 per cent. with, of course, a correspondingly lower cost. Although originally the application of water by the Hawaiian system was confined to a flow not exceeding 30 ft. in length, it was found quite practicable to increase the flow to 5 or 6 chains without seriously impairing the efficiency of the system.

"The main features of this system as carried out here for general use on a commercial basis are as follow:—Furrows are opened in such a manner that the soil from one meets the soil thrown out from the next, or else the soil is worked with a Cotton King or similar implement into a ridge between the rows immediately after planting. This relatively high bank of earth is maintained between the rows during the whole period of growth, and the stream of water in the furrow is regulated so that it does not at any period of irrigation rise more than one-third of the height of the bank. By these means the root system is not disturbed by the frequent use of implements necessary under the older methods of irrigation. As long as the top layer of soil is allowed to remain quite dry, weed growth receives no encouragement, and the crop growth is simply marvellous, which, in the case of cane, soon covers the ground and protects its root system from the effects of too much sunlight during the long spells of dry weather peculiar to this district."

Miscellaneous Crops.

Cotton, sweet potatoes, Upland rice, sorghums, velvet beans, soy beans, tomatoes, lucerne, and other miscellaneous crops were tested, valuable data being forthcoming in respect to the suitability or otherwise of each kind to the district.

The 5-acre area of Durango cotton (following cane) comprised a full set of plant-spacing tests. The opinion formed respecting cotton for this district shows that, so far as the experiments have gone, it seems reasonably certain that the district is suitable for cotton, provided that the crop is timed to ripen in fine weather, which usually lasts from May until December.

DEMONSTRATION PLOTS IN THE UPPER BURNETT AND CALLIDE VALLEY.

The policy of establishing demonstration plots in advance of settlement appeared to be much appreciated by landseekers and new settlers in the respective areas thrown open for settlement during the year by the Lands Department. Climatological stations were established to provide authentic records of conditions governing crop production. A series of crop trials at each demonstration area were designed specifically to determine the most suitable varieties to grow.

Special attention was paid to Durango cotton. The experiments, both in the Burnett and Callide, embraced "spacing" and "fertiliser tests," with a fair acreage devoted to the propagation of a choice strain for seed purposes. Plant, ratoon, standover, and late-planted plots were also provided for. The aggregate area cropped at each farm exceeded 20 acres.

In the Upper Burnett, the average return of seed cotton was approximately 1,000 lb. per acre (995 lb.). In the Government grader's opinion, the quality was superior to any other Durango cotton grown during the season in the State.

An exceptionally fine crop was produced in the Callide Valley, but frost experienced at Easter time destroyed the "top" crop, which, in this instance, would have been the main crop.

In the Burnett, different varieties of sorghums (grain and saccharine) were tested, with good results. Saccaline returned 45 bushels of seed and 19.4 tons of green fodder respectively per acre; Feterita 11 tons, and maize 10 tons of green stuff per acre. Late planted maize for grain was damaged by an April frost and yielded 18 bushels per acre. Sudan grass gave 2.8 and 1.2 tons of hay per acre for the first and second cuttings respectively, and Liberty millet returned 1.8 tons per acre. Cowpeas, clay and black, furnished yields per acre of 12 and 14 bushels of seed, and 28 and 25 cwt. of hay respectively. Sweet potatoes returned 2 tons, pumpkins 5 tons, and peanuts 2,350 lb. per acre.

In the Callide Valley, where 80 acres were cleared for cultivation, the returns were generally satisfactory. Fifteen varieties of sorghums were tried for fodder purposes, the yields ranging from 3¾ to 11½ tons per acre. Three varieties of Upland rice did not strike a very suitable season for development, owing to the dry period in January; the hay yield ranged from half to a little over a ton per acre. Cowpeas made good growth; of the three varieties tested, the lower yield was 8½ tons, and the higher 11 tons, of green fodder per acre.

Sudan grass made extraordinary growth, returning nearly 3 tons of hay and upwards of 12 tons of green fodder per acre. Liberty and Japanese millet yielded 2 tons 14 cwt. and 2 tons 18 cwt. per acre, whilst white panicum returned 3 tons 2 cwt. of hay per acre respectively. Peanuts, for which the Callide Valley alluvial soils seem particularly adapted, gave the high return of 4,234 lb. per acre.

The officer in charge of the Upper Burnett Demonstration Area, Mr. L. W. Ball, in summarising the year's operations, stated:—

"Prospects for a successful settlement in this district are good. It has been proved that the land is capable of growing good crops, and an examination of the rainfall chart shows clearly that the district is favoured with a very fair rainfall, and compares favourably with most of our recognised agricultural districts in that respect.

"The lighter types of alluvial soil along the various creeks in the settlement are admirably suited to the production of good seed-cotton. Peanuts should also prove a very payable crop on this type of soil. Lucerne, potatoes, grain, and fodder crops return profitable yields on these creek flats, and can be grown where the soil is a little too heavy for the production of good cotton.

"It has been found that the heavier types of soil produce too much wood in rather wet seasons, reducing the yield of cotton accordingly.

"The scrub lands, although requiring a little more outlay in order to bring them into profit, amply repay the extra work during the initial stage. When felled and burned, and either grassed or cropped, they are highly productive, and suitable for a variety of corps.

"As grazing country, the Burnett is already famous, the forest country being covered with excellent grasses throughout the settlement. Grasses are of good quality and very sweet, the soil having a fairly high lime content. Dairying can be carried on here with every chance of success, providing good-quality stock are introduced and provision made for succulent fodder during the winter months. Owing to the high elevation of this settlement (between 900 and 1,000 ft.) the winter is of longer duration than in districts having a lower altitude, and provision will have to be made for this by growing winter feed or storing the rank summer growths in the form of ensilage and hay, if dairying is to give the maximum returns it is capable of here.

"The Demonstration Farm has proved of much value to the new settlers in this district. Improved cultural methods have been adopted, and every effort made to secure the maximum return the season will allow. Intending settlers, and those already settled, have the benefit of the experimental work that is carried out here, and are able to familiarise themselves with local conditions. Supplies of acclimatised seed are being made available to the farmers already established."

FIELD REPORTS.

SOUTHERN DISTRICT.

Fodder Distribution.

A portion of the duties in connection with the issue of fodder and relief devolved upon this branch, necessitating an inspection of the areas from which applications were being received, and the institution of inquiries into individual cases of distress.

In order to control the distribution of fodder and prevent uneven or unfair participation in the benefits thus made available, a standard daily ration was established, and quantities equivalent to a supply for three weeks issued on this basis. All supplies of fodder were distributed by the State Produce Agency.

Prickly-Pear.

Many inquiries were made of the Department for economic methods of dealing with prickly-pear for stock-feeding, and in this connection inspections were made of two pear-slicing machines, patented by Messrs. Page, of Warra, and Sinclair, of Ipswich, reports thereon being subsequently submitted.

Wheat Propagation Plots.

Efforts in connection with wheat experimental work are concentrated on the propagation plots and variety trials established by Mr. C. S. Clydesdale, Assistant Instructor in Agriculture, on the farm of Messrs. Geitz Bros., Allora.

The plots, thirty-seven in number and each 1/80th of an acre, were sown subsequent to showers experienced during the latter part of June, 1923, and, owing to the light nature of the soil and its excellent mechanical condition, rapid germination took place. The varieties used had already been carefully tested in the preceding season, and their performances noted under varying conditions, only those showing sufficient evidence of merit to warrant their further propagation being persevered with.

Results of Wheat Experimental Work.

In connection with the raising of supplies of pure seed to ensure that the best varieties are brought and maintained in general cultivation, provision has been made to continue the system of reimbursing growers who undertake this class of work for the Department, by giving an enhanced price for the resultant seed, if of good sound quality.

Wheat now known as Cedric, Novo, Roma Red 2, Roma Red 5, Roma Red 7, and Warchief have already been widely distributed, the high yields obtained up to 40 bushels per acre, in some instances of 28 and 30 bushels, being in itself sufficient to create a keen demand.

Performance of Wheats Under Dry Conditions.

In addition to the thirty-seven plots enumerated above, variety tests comprising ninety-six varieties of wheat and twenty-one varieties of barleys were sown at Allora, and, although climatic conditions were the reverse of favourable for the purpose of making a fair comparison of yields, they were ideal for testing the drought-resisting qualities of the varieties experimented with.

Outstanding types in this respect were—Pusa 4, Novo (B x IP9), Florence (unnamed crossbreds), and SE x W8 and SE x W79.

The single-row tests did remarkably well, and it is considered that they are worthy of further trial, under conditions more approaching the normal, before any attempt is made at their classification.

Wheat Plots, Allora.

In order that the policy of wheat improvement might be continued and the chosen Roma crossbreds be subjected to further field trials, an extension of the wheat propagation plots for 1924-25 was arranged for, details of which are as follows:—O. Hentschell, Allora—Plots sown 16-5-24--19-5-24—B x Am22, 1 acre; B x Am22 sel., 1 acre; Bobs x Flo.9, 1 acre; S.E. x Warren 6, 1 acre; B2 x Flo.2, ½ acre; B2 x Flo.T2, ½ acre; B2 x Flo.T4, ½ acre; B x Man10, ½ acre; B x Man16, ½ acre; B x Marq.1, ½ acre; B2 x Flo.T1, ¼ acre; B2 x Flo.T5, ¼ acre; B x Man12, ¼ acre; B x Man22, ¼ acre; B x Man29, ¼ acre; B2 x War 2, ¼ acre.

Inglewood.

E. Rowlings, Inglewood—Sown 8-5-24—CCC2, 1 acre; SE x War8, 1 acre; SE x War79, 1 acre.

Fertiliser and Wheat Plots, Campbell's Plains, Warwick.

A fertiliser test was arranged for on the farm of Mr. E. M. Larsen, at Campbell's Plains, for the purpose of ascertaining the value of certain fertilisers on the shallow ridgy areas situated adjacent to the Warwick-Maryvale line, this class of country having been described to this Department as being unresponsive to fertilisers and ordinary methods of cultivation, also that crop yields were gradually diminishing.

The following fertilisers were utilised:—Superphosphate, Nauru phosphate, and a mixture composed of Nauru phosphate, superphosphate, ammonium sulphate, and potassium sulphate.

Plots of one-sixth of an acre were established and laid out in the following manner:—(1) Unmanured, (2) 1 cwt. superphosphate per acre, (3) 1 cwt. Nauru phosphate per acre, (4) 1 cwt. Nauru phosphate and superphosphate mixed, (5) 1½ cwt. complete manure, (6) 3 cwt. complete manure, (7) unmanured.

Variety Trials.

The wheat used for the trial was CCC3 (Cretan x Comeback x Cretan). The following plots, each of 3 acres and having a fertilised strip of one-fifth of an acre through the centre, were sown for the purpose of a variety trial:—(1) Cedric, (2) Roma Red 2, (3) Amby, (4) BO x Flo.4, (5) Novo, (6) CCC3; the fertiliser used being the complete mixture at the rate of 1½ cwt. per acre. The plots were sown on 10-5-24--14-5-24.

Wheat Plots, Allora.

H. Geitz, Allora.—Sown 19-5-24--21-5-24.—Propagation and variety tests with an 8-acre propagation plot of Cretan x Comeback x Cretan. Fifty 1/80th-acre plots, 35 single drills of wheat, and 21 single drills of barleys, were sown under favourable conditions.

Pig and Dairy Fodder Plots.

With a view to educating dairy farmers and others interested in the production of fodder crops for dairy stock and pigs, an extension of the dairy and pig fodder plots has been arranged for during the year, particulars of which are as follows:—Pig fodder plots—G. T. Beverley, Bunjurgen, *viâ* Boonah; sown 16-4-24. Dairy fodder—W. T. Beverley, Bunjurgen, *viâ* Boonah; sown 17-4-24. Pig and dairy fodder—G. B. Mouatt, Kilcoy; sown 19-4-24. D. E. Greggery, Mount Lawless, Gayndah line; sown 21-5-24. Germination has been satisfactory, and so far good headway is being made by most of the varieties.

Special Reports.

The services of this branch were requisitioned by the Lands Department for the purpose of inspecting and reporting on the agricultural possibilities of a reservation situated near Boolbunda, on the Mount Perry line. Advice has since been received that recommendations made in the report thereon have been adopted.

The recent drought in many instances was instrumental in again impressing upon the farmer the necessity of making provision for reserves of fodder against dry periods, and in this connection practical demonstrations have been given and information afforded in silage matters.

The practical and theoretical examinations of third-year (diploma) students in Agriculture, held at Gatton Agricultural College and High School, also claimed the services of this branch for the purpose of setting and correcting the papers and conducting the oral examinations.

CENTRAL DISTRICT.

Agricultural Instruction.

A special visit was paid to the new settlement area in the Callide Valley, and farm-to-farm calls made to render the fullest possible information to the allottees of farm holdings. Approximately 100 persons were personally interviewed.

The settlers are of a good class, and, although the major portion are unfamiliar with Central Queensland conditions, development work was going on on all sides. Personal contact in this way proved a useful medium for imparting information on pioneering matters; the laying out of farms; water supply; the preparation of land for crops; the most suitable crops to grow; when and how to plant, &c.

The Late Cotton-planting Season.

Cotton-planting was much later than it should have been, and at the conclusion of the season there was evidence in each locality visited of an abnormal development of wood, induced by the heavy rains and forcing conditions experienced in February and March. Had there been anything like a fair crop of bolls to steady the rush of sap, yields would have been much better. As it turned out, a heavy frost was experienced in April in the districts removed from the coast. Late planting, insect attack, and frost proved detrimental to this year's yield of cotton.

The rainfall for the year was as follows:—July 35, August 21, September 45, October 11, November 251, December 341, January 122, February 831, March 533, April 471, May 48, and June 308 points respectively, the aggregate being 30.17 in. with eighty-two wet days.

Sweet Potatoes.

During the year the improvement work instituted by Mr. Brooks was carried on, with the result that forty-two new seedlings were propagated, and fourteen American and Hawaiian varieties were introduced to this State, comprising Blancia, Gold Coin, Gold Skin, Tantalus, Southern Queen, Madeira, Yellow Yam, White Yam, Delicious Yellow, Nancy Hall, Porto Rica, Bermuda, Yellow Strasburg, and Red Carolina.

The dry conditions in the early part of the year militated against normal development work, supplies of tubers being limited. Propagation had to be carried out by cuttings. Propagation beds were established for the new seedlings and the introduced varieties, these beds proving a great help both for the classification and the usual extension work.

Great interest is being taken by farmers in the whole scheme of sweet potato improvement, and a keen demand for cuttings was maintained, 16,000 being distributed practically throughout the length and breadth of the State.

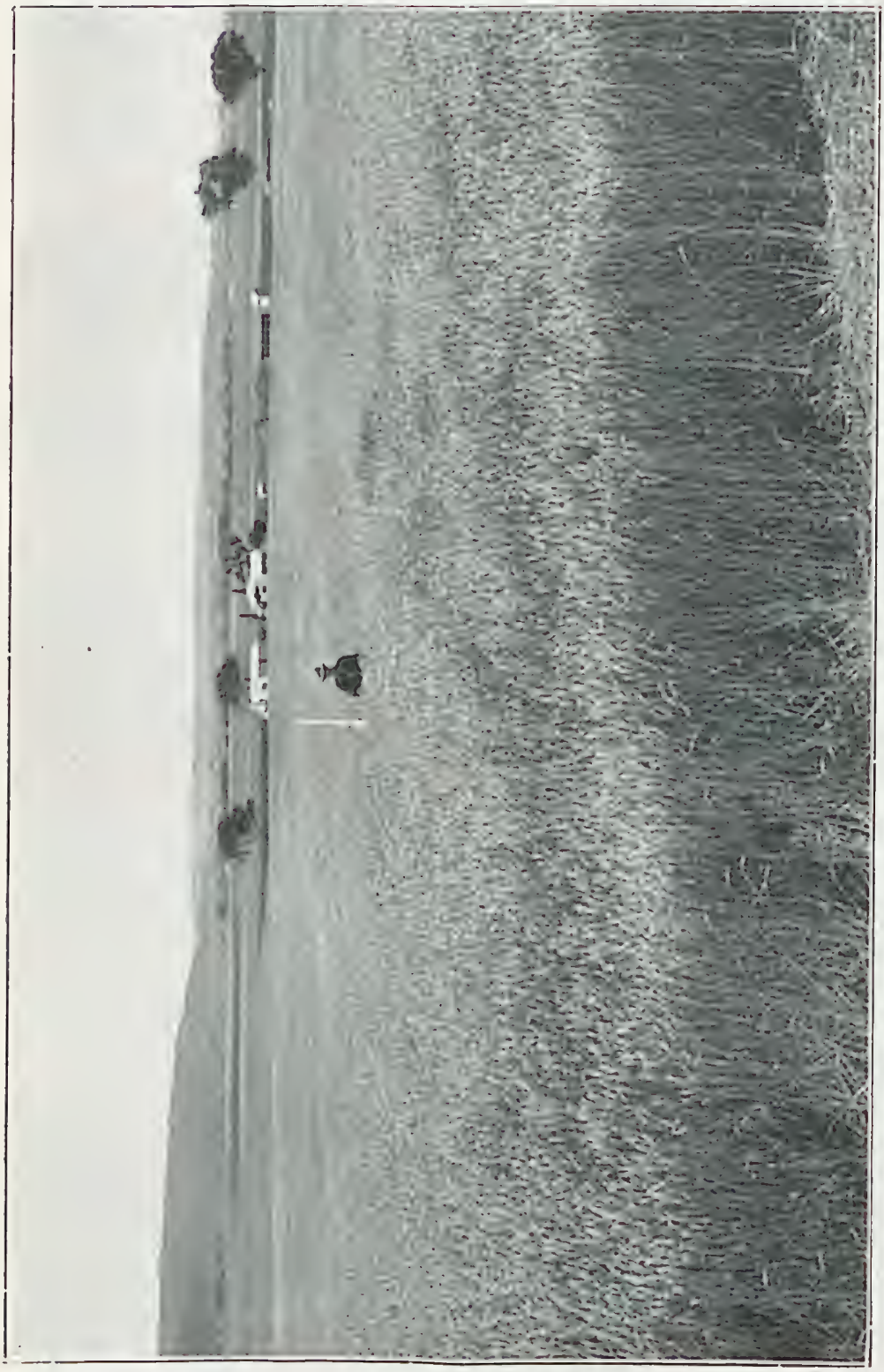


PLATE 1.—DEPARTMENTAL STUD WHEAT PLOT ON MR. HENSCHEL'S PROPERTY AT ALLORA.

"Mountain or River or Shining Star. There's never a sight can beat—Away to the skyline stretching far—A sea of ripening wheat."

PLATE 2.—A SCENE IN THE LOWER FREESTONE VALLEY.
"When the burning harvest sun sinks low, And shadows stretch on the plain,
The roaring strippers come and go Like ships on a sea of grain."

Owing to the continuation of the drought, it was found necessary to establish a central propagation plot on Messrs. Pritchard and Wannop's property at Archer, where there is an irrigation plant. This latter proved a most satisfactory solution of the trouble anticipated in starting and testing out the large number of varieties on hand. Twelve smaller plots were also established in different parts of the State, namely:—At North Rockhampton (Mr. McDougall); Gogango (W. F. Bond); Cawarral (H. Tooker); Biggenden (J. Todd); Mount Larcom (F. E. Sturm); Sarina (A. Innis and P. C. Brooks); Marlborough (O. V. Muller); Gracemere (W. Marks); Boondoola (T. Patterson); Mackay (J. Jones); The Caves (A. Bernhard).

Experiments (Boyne Valley), A. J. Turner's Property, Ubobo.

Last season's winter fodder crop trials, comprising fifty-two separate tests, each 1/40th of an acre, with wheat, barley, oats, rye, field peas, &c., failed on account of the drought, the crops reaching a height only of 12 in. All fodder crops were grazed off, and the land was then prepared for a summer crop of white panicum. Although sown on 5th November the seed did not germinate until 21st December, a fall of 220 points of rain ensuring a good start. January proved hot and dry, but February rains produced a good crop, which returned 3 tons of hay to the acre.

Immediately following the crop of white panicum, the area was prepared for this season's fodder and fertiliser tests by ploughing in March, cross-ploughing in April, with subsequent harrowing to bring the soil into good condition for planting.

With good moisture present, sowing was carried out on 25th April, the whole series of fifty-two plots being planted. A recent inspection showed the young crops to be looking well and giving good promise.

Fertiliser Tests with a Rotation Crop of Cowpeas, A. J. Turner's Property, Ubobo—Plot 2A.

Each plot 1/10th acre. The following results were obtained from the cotton fertiliser tests (Durango cotton) planted during 1923 and harvested at the conclusion of the season this year:—

Fertilisers.	Lb. per Acre.	Lb. per Acre.
No. 1—Unmanured	..	691
No. 2—Basic superphosphate	168	773
No. 3—Meatworks	224	773
No. 4—Holborne Island phosphate	168	844
Basic superphosphate	168	691
No. 5—Sulphate of ammonia	56	..
Basic superphosphate	168	803
No. 6—Superphosphate	56	..
No. 7—Unmanured	..	915
No. 8—Basic superphosphate	168	..
Sulphate of potash	56	803
Sulphate of ammonia	56	..
No. 9—Holborne Island phosphate	168	..
Sulphate of potash	56	793
Sulphate of ammonia	56	..
No. 10—Sulphate of potash	56	845
Sulphate of ammonia	56	..

After the removal of this crop (cotton) the land was ploughed in September, and planted with cowpeas on 5th November. No rain fell until 21st December, when 220 points were registered; this gave the crop a good start. Hot weather during January checked development; however, good rains during February saved the situation and excellent growth resulted. A return of approximately 5 tons per acre of green fodder was obtained.

Plot 2B—Similar Lay-out to 2A.

This area was planted to Durango cotton with fertilisers during the first week of November, a good germination of seed resulting. The plants attained an average height of 5 ft., but produced little or no bottom crop, due to heavy insect attack. Small pickings were made, but, not being comparable, the results were practically nil.

Boyne Valley—English Potato Trials Under Irrigation at Messrs. Muspratt and Henwood's Property, Littlemore.

The land occupied by these trials is a medium chocolate loam, alluvial in character, which had been lying fallow prior to cropping.

Cultivation.

The land was ploughed and cross-ploughed in January; harrowed during February; ploughed again in March; harrowed and cultivated twice, with a final harrowing immediately before planting. As a result the land was in excellent tilth.

Four varieties of potatoes were used—Brownells, Blue Skins, Carmens, and Manistees. Owing to unavoidable delay in delivery, the two latter varieties arrived in a very unsatisfactory condition; fully 20 per cent. of the Carmens and 50 per cent. of the Manistees had to be discarded. Planting was carried out on the 12th and 13th March, with the following result:—

Variety.	Area.	Per Cent. of Germination.	Small Tubers.				Yield—Saleable Tubers.				Total Weight per Acre.			
	Acre.		Tons	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.
Blue Skins ..	·27	85	0	0	3	3	2	7	2	10	2	8	1	13
Brownells ..	·4	80	0	11	3	23	1	7	1	8	1	18	3	5
Carmens ..	·16	98	0	12	3	1	2	14	2	12	3	7	1	13
Manistees ..	·05	65	0	4	3	3	2	12	3	14	2	17	2	17

Frosts were experienced on 21st April, much earlier than they usually appear. Rain fell on 2nd June (40 points). This was followed next day by a heavy frost, all varieties being affected except Brownells. However, additional frost on 7th June effectively stopped all growth. Harvesting operations were carried on at the latter end of the month. Generally speaking, results were fairly satisfactory, considering the unusual frost in April.

Cotton and Fodder Crops.

Several tests were instituted in the autumn to determine whether the planting of fodder crops, barley, oats, and rape between the rows of cotton would be a suitable practice for dairy farmers to adopt in cases where the cotton had made poor growth through want of rain, the seed of the fodder crops being scuffled in. In two instances, rain induced a heavy growth of foliage and branches on the cotton plants, and effectively checked the development of the fodders.

Later results will indicate whether anything is to be gained by tests of this character, which, in the case of maize in some districts, have much to recommend them.

Fodder Conservation.

Owing to the bountiful summer season, fodder crops of all kinds made excellent growth. Many farmers turned their attention to ensilage. A demonstration was given at Alton Downs and a number of farmers invited to inspect the work of cutting and stacking the crop of saccaline, some 60 tons of fodder being stacked. Great interest was shown in the work.

NORTHERN DISTRICT.

Seasonal conditions for the first seven months from July to January were marked by such a paucity of rainfall that the period stands out as the driest known since rainfall records have been made. Only for the fact that, except in the districts of heaviest rainfall, the whole of the North experienced an above-average precipitation in June, and portion of the coastal slopes a like fall in August, the losses in stock from scarcity of feed and water would have been enormous; as it was, on many pastoral holdings the losses were more than 50 per cent. of the total herd, while graziers who lost less than 20 per cent. considered themselves very fortunate. This extreme dryness was accompanied by an extraordinary long and cold winter, especially on the Atherton Tableland, where heavy frosts occurred daily for weeks, preventing any growth and drying up all the existing pasturage. To add to this bad state of affairs many fires broke out in different parts, which were only checked with extreme difficulty after destroying the greater part, if not the whole, of the pasturage on the holdings they passed through.

Instruction.

The call for instruction and advice in the many matters of interest to the agriculturist is becoming greater each year as the efforts of this Department are becoming known and appreciated. To such an extent is this the case that it has been found impossible to satisfy all those desirous of a personal visit; while much may be done by correspondence, advice on the spot, frequently with practical illustrations, will be found to be of much greater value to the struggling settler; so it is a matter of regret that in many instances, especially in the case of isolated settlers, numbers of such visits could not be paid. Without a more rapid means of locomotion than the horse, it may be expected that, as the call becomes greater, the number disappointed will increase and the activities of the instructor be narrowed down to the districts most closely settled.

The higher cost of everything the farmer needs, including that of labour, together with the general increase in local authority rates, in some cases over 3 per cent. on the valuations made, without a corresponding increase in the prices he receives for the produce he sells, makes it more than ever imperative that attention should be given to greater production at a lower rate of cost, in order that farming operations can be carried on without loss, if not with profit. With a realisation of this, more attention is being given to better methods of cultivation, selection of seed for sowing, the most suitable varieties, use of fertilisers, fodder conservation, and the growth of suitable crops to feed off, &c., &c., while more consideration is being paid to that balance in the ration calculated to promote the greatest flow of milk or to result in the greatest increase in growth.

In the Tablelands district, including Mount Molloy, the departmental plots in demonstration and experiment are watched with great interest, and much credit is given for the information conveyed thereby, which, with the personal advice and instruction imparted, has resulted in much improvement in farming methods. Here the call for personal visits is very great, and will necessitate much more time being spent there in the future.

In these districts the settlers are imbued with the advantages of co-operation, and, in addition to two butter factories erected by the Atherton Tableland Co-operative Butter and Bacon Co., another has this year been erected and placed in operation at Bushy Creek, in the Mount Molloy district; an up-to-date bacon factory has been erected and is now in operation between Mareeba and Biboohra at Floreat, under co-operative auspices; whilst a pig pool has been operating for some time, and a maize pool has been formed to deal with this year's crop and those of the succeeding nine years. In connection with this pool, storage facilities in the form of reinforced concrete silos have been erected at Atherton, Tolga, and Kairi respectively, with machinery for conditioning and drying where necessary.

It is confidently expected that the additional price that will be received by the grower under the maize pool as compared with that received under the previous system of marketing will be, as is the case under the pig pool, very much to his advantage. In the marketing of other forms of produce the butter company is a means of distribution, and indications are not wanting that before many years are past the whole of the selling and buying on behalf of Tableland farmers will be done co-operatively.

Experimental Plots, Etc.

In experimental work, all crops planted last year which, in the natural course, would mature during this year were failures, except in the instance where a trial of tomatoes was grown at Bowen under irrigation. Those crops, however, sown during the last six months of this year have done extremely well and produced some interesting results.

Tomatoes and Cucumbers.

A trial in resistance to "wilt" (Fusarium sp.), with four varieties, seed of which was secured from U.S.A., in comparison with a local variety, was carried out at Bowen. The varieties were—Norton, Norduke, Columbia, Marvel, ex U.S.A., and Bowen Buckeye, a local variety selected by this Department some three years ago for its disease-resistant qualities as well as for its general excellence all round. (This variety was originally named Hurst's Buckeye, but as a firm of London seedsmen advertise a variety under that name it was decided to alter the name to Bowen Buckeye.)

The trial was very satisfactory, each of the five varieties proving very resistant, there being nothing to choose between them in that respect, since not one showed any sign of Fusarium, while a susceptible variety, planted between, developed the disease to the extent of 100 per cent. Though Marvel proved the best cropper of

PLATE 3.—A WHEAT FARMER'S HOME, CAMPBELL'S PLAINS, DARLING DOWNS.
Mr. E. M. Larsen's Homestead.

PLATE 4.—FUNKER'S CROSSING, STANTHORPE.

the imported varieties, the size of the fruit was somewhat small for marketing, though for canning it would be ideal. The other imported varieties were excellent in points of size, solidity, shape, carrying capacity, flavour, and colour, comparing in those respects very favourably with the Bowen Buckeye, but less favourably in cropping capacity.

This season comparative trials were carried out on two farms on the Tableland, where the Bowen Buckeye again demonstrated its superiority in yield, whilst all varieties again proved disease-resistant. In these latter trials Marvel improved in size, and may do so in the Bowen district when grown from acclimatised seed.

The five proved disease-resistant varieties are regarded as distinct acquisitions, much credit being given to the Department for their introduction, especially for the Bowen Buckeye, which now is grown so extensively at Bowen as to comprise fully 90 per cent. of the crops.

Fertilisers on tomatoes in comparative trial are being undertaken on three farms in the Bowen district, the results of which, however, will not be available until the coming year. At present the plants appear improved on each of the fertilised plots over the control, and interesting results are forecasted.

Cucumbers with fertilisers in comparative trial have been sown on two farms in the Bowen district. In these the fertiliser, besides being differently compounded, is applied in a shallow drill between the irrigation furrow next the row of plants, and broadcasted and worked into the soil where the cucumbers are grown to test the efficacy of both methods on each plot. Though finality has not yet been reached, each plot under fertiliser is cropping better than that without any fertiliser, and the broadcasting of the fertiliser appears to be productive of a better result than when applied in the drill.

A trouble with cucumbers in the past was that when carried to the distant market the colour deteriorated, any light colour becoming tinged yellow, which is undesirable. To test the value of fertilisers in overcoming this defect, a quantity of fruit was secured from each plot and kept for a week; while some of the plots showed an improvement, it is considered that improvement will most easily be obtained by judicious seed selection.

Cigar Leaf.

An experiment with fertilisers in comparative trial was arranged on one farm in the Bowen district, and fertilisers applied to the plots, which were prepared for a transplanting of young plants from the seed-beds. An attack by "blue mould," however, destroyed all the plants in the first and successive seed-beds, and it was not for some months that a successful lot of seedlings was raised; by this time heavy rains had fallen, and the plots had to be ploughed and worked up again, so distributing the fertiliser that it was not considered advisable to make any record of yield, quality of leaf, &c.

More attention is being paid to this crop now that the price has risen, and it is anticipated that in the Bowen and Proserpine districts, where cigar-leaf of acceptable quality can be grown, a much-increased acreage will be put under crop.

Cotton.

Two experiments with fertilisers in comparative trial were arranged on cotton plots at Carbeen and Charters Towers respectively. That at Carbeen proved of no comparative value, owing to the poor stand of plants secured and to the inability of the farmer to successfully cope with the abundant weed growth; but at Charters Towers, where an excellent stand of plants was secured and every attention paid to cultivation, interesting results are expected, since not only is growth of plant much better on the fertilised plots but the quantity of bolls setting appears greater. Owing to the rains not coming until the middle of February this crop was not matured in time to be recorded this year. The Charters Towers district, as well as that of Mareeba, gives promise of producing in normal seasons satisfactory crops of cotton in which quality and length of staple will compare favourably with other districts in the State. In the Cook district, on a small area in the previous year, a very fine quality of Durango with satisfactory length of staple was also grown.

A large number of seed selection areas to be planted with special seed of the Durango variety were arranged, but, owing to the late appearance of the rains, in many instances delayed until February, a lot of these areas were not planted. Of those planted, the greatest success at present appears to promise at Mareeba, where an earlier and better fall of rain was experienced and a less infestation of boll-worm than was the case with the areas planted at Bowen, the Lower Burdekin, and Mutarnee. Here, boll-worms were very prevalent, little or no cotton being harvested

off some of the areas. The one exception to boll-worm attack was at Mr. T. Anderson's farm in the Bowen district. Mr. Anderson is isolated to the extent that there is no cultivation within a couple of miles, and perhaps on this account, or possibly to the continuous patrol of the area by a flock of guinea fowl, no boll-worms or other insects were noticeable, with the exception of a few Chinese bugs which were confined to the upper parts of the plants.

At Charters Towers, two areas planted after the rains in February have made a very nice growth, and, if no frost is experienced, should yield a fair return but not so good as would have been the case had the rains come earlier and allowed of growth in the warmer months.

At Cooktown and on the McIver River the areas promise well, especially at A. Millar's farm on the Endeavour River, where at Easter when the area was visited an exceptionally fine growth of plant was in evidence, with squares forming abundantly, with an apparently total absence of injurious insects. These areas have been planted in different months and will afford a useful comparison in that respect.

On the Northern coastal lands it is considered that the same necessity for early planting as advocated in more southern localities does not exist, since the winter is usually free from frost, with temperatures not much lower than those of the summer in certain districts where the crop is successfully grown.

The general crops of cotton in the North will not produce a large amount of cotton this year, due largely to an unpropitious season and to the damage sustained from insect attack. The Charters Towers Cotton Growing Company, who had some 80 acres under crop last year, from which, owing to the drought, a very poor yield was obtained, have an area of some 70 acres under crop this year, which, although planted in late February, has made a remarkably fine growth, and, being free from serious insect attack, should, if not hampered with a cold winter, yield a satisfactory return. On the Lower Burdekin, two growers who have areas of over 20 acres each under crop, and who will harvest a very poor return owing to boll-worm attack, are so satisfied with the growth of the cotton plants that they signify their intention of planting up an equal or greater area next year; both, it is understood, have had experience with the crop in Mexico.

Maize.

Experiments with fertilisers in comparative trial on maize were continued at Tolga on forest soil, and at Kairi on scrub soil. Owing to the plots at Kairi being in a small area of country which missed all the useful rains over a period of some seven weeks during which the flowering period occurred, none of the plots yielded 20 bushels to the acre, and the trial was written down as a failure. At Tolga the plots were subjected to a shorter dry spell, and, though the yields were lower than what might have been expected had the season been more favourable, the results were satisfactory, all fertilised plots giving a higher yield than the non-fertilised plot, the highest being 54 bushels 5 lb. as against the lowest yield of 38 bushels 54 lb. obtained on the non-fertilised plot. The greatest profit from the application of fertiliser was gained on the plot to which 180 lb. of superphosphate was applied, where the increase in yield was secured at a cost of 1s. per bushel.

This experiment, which has been conducted on the same farm for the past three seasons, as well as one other farm in one year, has resulted in favour of 180 lb. of superphosphate each year as being the most profitable on forest lands that have not been under cultivation for many years.

The varieties of maize, mainly of the Dent type, now in general cultivation throughout the rest of the State, are too deep in grain and of insufficient hardness to suit the Tableland climatic conditions, which, owing to a humid atmosphere, require a shallower grain of a flinty type that will dry out better and not be so susceptible to moulds. The many new settlers, especially on the Tolga Soldier Settlement, have tried many of the Dent type varieties to the great interpollination of the variety generally grown, but the general consensus of opinion now agrees with that expressed by this Department years ago, that what is known as the Tableland main crop variety is the most suitable and profitable to grow. It is an extremely difficult matter, however, to secure seed that has not been crossed with other varieties.

To remedy this and to endeavour to improve the main crop variety, a selection of cobs was made last year for "ear to row" tests this year. These cobs were sown at Kairi each ear to a row, the alternate rows being detasselled and harvested separately, the result being a great variation in average yields per acre. The following is the result:—40 bus. 13 lb., 42 bus. 34 lb., 44 bus. 32 lb., 46 bus. 21 lb., 48 bus. 9 lb., 48 bus. 32 lb., 50 bus. 42 lb., 50 bus. 52 lb., 52 bus. 7 lb., 52 bus. 7 lb., 52 bus. 29 lb., 54 bus. 6 lb., 54 bus. 17 lb., and 56 bus. 16 lb.; a difference in yield of 16 bus. 3 lb. between highest and lowest—conclusive evidence of the value of the "ear to row" method in raising the yield. Ears from the best rows have been selected for further trials next year on more than one farm.

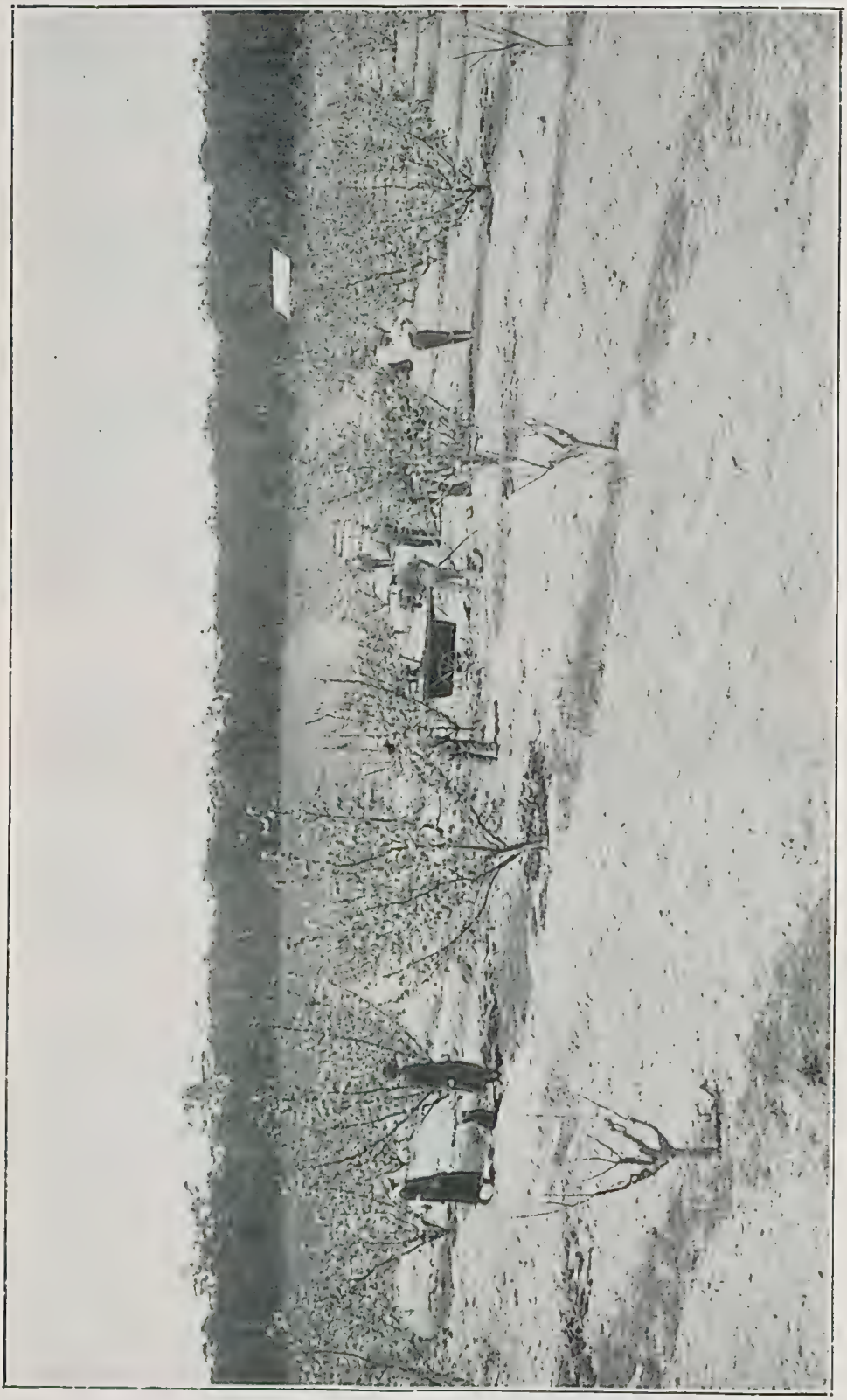


PLATE 5.—APPLE TREES (GRANNY SMITH) IN BLOSSOM, MR. LUMB'S, THULIMBA

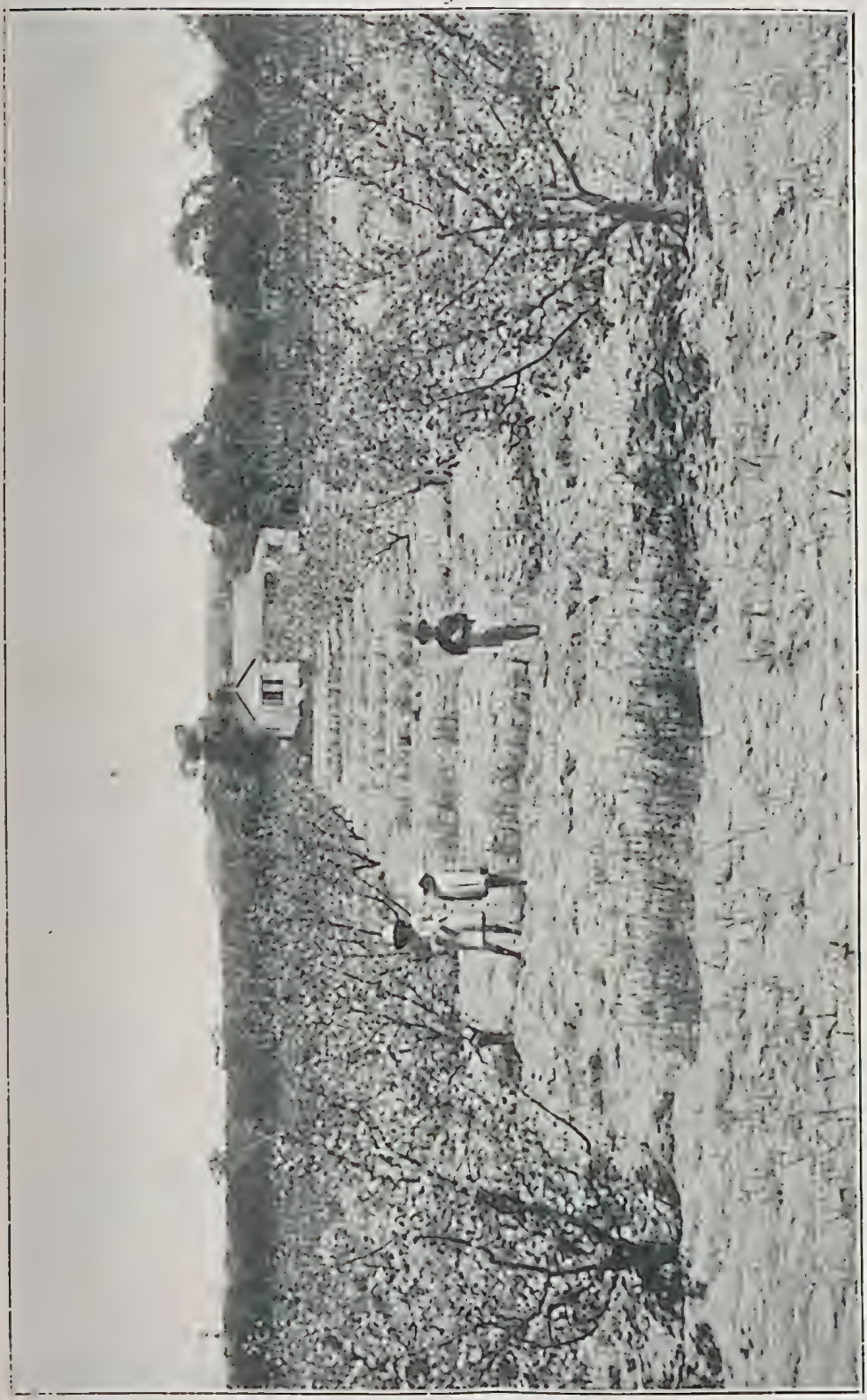


PLATE 6.—AN ORCHARD IN THE GRANITE BELT. GRAVENSTEIN APPLE TREES, EIGHT YEARS OLD, ON MRS. BUCHANAN YUILLE'S PROPERTY, THULIMBA.

The whole crop on the Tableland this year will be large, and, though the average yield will not be so large as in some previous seasons, the greatly increased acreage under crop will put the total yield in the vicinity of some 20,000 tons.

Peanuts.

Seed selection areas of White Spanish and Red Cross, both bunch varieties, were arranged at Carbeen and Kairi. The White Spanish variety at Carbeen, on O. T. M. Hansen's farm, returned the very fine yield of 1 ton 18 cwt. 2 qr. 8 lb. per acre of extra fine quality nuts; the yield of the Red Cross variety at Kairi has not yet been determined.

The peanut as a crop does remarkably well at Cooktown and on the Tableland, but high freights operate against it when shipped to a Southern market. Were machinery installed to shell the nuts and to express the oil it would appear more profitable, since the by-product in the form of oilcake would find a ready market at the door, while freights on the manufactured article would be very much less. At Cooktown an area was planted with fertilisers in comparative trial, but are not yet harvested; in the early growth of plant a marked improvement was noticeable on the area to which the fertiliser was applied.

Fodder Crops.

With a view to popularising the feeding of green crops in their early stages of growth to dairy and other stock, so as to narrow the nutritive ratio occurring when pasturage alone is supplied, and thus to augment the flow of milk or to increase the animal growth, and to secure data for settlers converting their present maize farms into mixed farms, a series of crops for summer and winter growths have been tried, the latter during the past four seasons and the former last year and this. The results are very informative, and point conclusively to the greater profit to be derived from a more intensive system of farming than prevails at present.

The trials of summer feeds were made this year on forest soil at Tolga, where conditions are somewhat drier than in the scrub areas. The results show:—

Giant White Panicum in thirteen weeks' growth, when in full seed, gave a cutting of 11 tons 5 cwt. of green fodder.

Pearl Millet, cut after the first six weeks' growth, yielded 6 tons 2 cwt. 16 lb., while the second growth after eight weeks yielded 7 tons 14 cwt. 1 qr. 7 lb. of green fodder.

Liberty Millet for eight weeks' growth yielded 3 tons 4 cwt. 1 qr. 7 lb.

Japanese Millet for six weeks' growth yielded 3 tons 17 cwt. 16 lb. Successive sowings were made with giant white panicum, but, owing to a visitation of a pest of "army worms," these as well as the second growths from the other crops were destroyed.

Teosinte, which has given excellent results in a previous year, was a failure this year owing to defective seed which only gave a germination of 1 per cent.

Legumes for green feed, hay, or as an admixture with maize for ensiling yielded as follows:—

Groit Cowpea, 16 tons 11 cwt. 11 lb. green stuff per acre.

Grabham Cowpea, 12 tons 17 cwt. 16 lb. green stuff per acre.

Victor Cowpea, 9 tons 11 cwt. 1 qr. green stuff per acre.

Early Georgia Velvet Beans, 10 tons 18 cwt. 2 qr. 8 lb. when the first pods were setting.

The three varieties of cowpeas are new to North Queensland and have proved superior on the Tableland to the varieties generally grown. The Groit variety was sown over two months before the other two, to which it probably owes its increased yield.

The velvet bean promises to be a crop of extreme value, since not only is its yield very satisfactory but it proves palatable to stock at all stages of growth when green, and makes a very good quality of hay. Grown with maize it should make superior ensilage, since its nutritive ratio is as 1:3 when green and 1:3.6 when made into hay. The beans when matured make an excellent feed for pigs or, when ground up, for dairy cows.

Crops grown last year for winter green feeds failed owing to want of rain, but those sown this year give every promise of fine yields.

Florence Wheat.

This variety, introduced by the Department some years ago, is the one now generally grown on the Tableland, and has produced some very fine crops for hay this year.

Field Peas and Vetches.

These crops do remarkably well on the Tableland, alone or combined with wheat, and, following their successful demonstration on the trial plots, are becoming each year more popular.

As an indication of the value of demonstration plots and instruction afforded to farmers by the Department, the area now sown to wheats and other crops for hay or winter green feeds is very marked, especially when some few years ago little or nothing in this line was attempted. This year demonstration plots in winter green feeds have been planted up at Bowen, Charters Towers, Mount Molloy, Tolga, Atherton, Evelyn, Ravenshoe, Malanda, and Peeramon, all of which are giving promise, but which cannot be recorded until too late for this report.

The yields of similar plots grown in previous years, as well as this, afford evidence that, when grown and fed judiciously with the pasture, not only can more dairy cows be carried on a given area, but they can be expected to produce a greater average profit per cow.

Honey Sorghum.

A small quantity of this celebrated sorghum was secured from U.S.A., and sown on a seed selection area at Carbeen, where it gave a fine yield of 25 tons 5 cwt. 2 qr. 12 lb. of fodder on the first cut. This variety compares very favourably with that grown as saccharine, and arrangements have been made in seed selection areas each year, in order that supplies of pure seed may always be available.

Rape.

Demonstration areas of dwarf Essex rape are being grown on the Tableland for feeding to pigs. This crop does remarkably well there, and affords a great amount of succulent fodder which will tend to popularise it as a pig feed.

The sure market for pigs now obtaining through the establishment of a bacon factory on the Tableland is creating more interest in the feeding of those animals and the growth of crops for that purpose. With crops of arrowroot, sweet potatoes, maize, sorghums, pumpkins, rape, sunflowers, velvet beans, cowpeas, lucerne, &c., &c., proved to do so well, the farmer has a wide choice, and, as many of the same crops are also valuable as feed for the dairy cow, the combination of dairying and pig raising may be expected to prove very remunerative.

Lucerne.

The area sown with this remarkably valuable crop is increasing year by year, but not to the extent that its value warrants. The difficulty of making hay on the Tableland has had a deterrent effect, but as the value for feeding green to dairy cows and pigs is becoming appreciated, it is expected that ere long each farm will have an area under that crop. Areas of 1 acre each under varying quantities of lime were sown this year at Bowen, where it will be irrigated when necessary, and at Evelyn, at both of which places a good stand of plants was secured. At Tolga, where a trial was made the previous year on forest soil which gives an acid reaction, the limed portion gave nearly 1,000 lb. greater weight of green stuff per acre than that without lime. This area was recently topdressed with basic super. in varying quantities, but no cut has yet been made.

Potatoes.

This crop has received more attention in the Bowen district, where a much-increased area is under crop this year, but not on the Tableland, where in the forest soils it has been proved in the Department's trials to do so well. Owing to my absence on special work and the resignation of the assistant instructor, comparative trials were not arranged for this year, but arrangements have been made for three areas on the Tableland in the coming year, from which it is anticipated that seed will be available for similar areas on the coast for March or April planting. A difficulty is experienced in obtaining suitable seed for planting in March or April, as well as in October or November, so that an interchange of seed between Tableland and Coast, in which the planting seasons of the one occur at or shortly after the harvest of the other, would be of great advantage.

PLANT DISEASES.

No very serious outbreaks of plant diseases have occurred in the Northern Division during the period under review.

Sorosporium Reilianum or "Head Smut" on maize was more prevalent on the Tablelands than in previous years, and may be expected to increase unless the pernicious system of growing the one crop year after year on the same land is altered and a judicious system of rotation of crops adopted.

Urophlyctis Alfalfæ or "Crown Warts" on lucerne, a new malady to the Tableland and identified as such by the Vegetable Pathologist, has appeared on a great many of the farms there, but not to the extent that it has resulted in any great degree of damage. Information and measures of control on both these diseases have been published in the local Press as well as being supplied orally when visiting affected areas.

Fusarium Sp. or "Wilt" of the tomato has been largely minimised by the growth of the resistant varieties introduced by the Department, and it is worthy of note that *Septoria* is also less evident on these varieties.

Blue Mould on cigar-leaf tobacco was serious in one instance in the Bowen district, seed-bed after seed-bed being destroyed before a successful transplanting was secured. So far no successful treatment or preventive measure has been discovered for this malady, and some experiments in that direction will be inaugurated this coming season.

Insect Pests.

Due, perhaps, to the season being in their favour, insect pests were more severe this year than for several years previously. On cotton in many instances great havoc was wrought by the boll-worm *Chloridea obsoleta*, which also as the tomato grub, maize grub, and army worm did a good deal of damage to tomato, maize, and the young growth of fodder crops. The approach of cold weather, however, greatly minimised this pest.

At the close of the last departmental year and the beginning of this a caterpillar of *Oncopera mitocera*, described in the "Q.A.J." for August, 1921, by Mr. Alan P. Dodd, did great damage to the paspalum pastures on several of the Tableland farms. This pest can be expected to do damage in parts occasionally, but cannot be viewed as likely to be a pest at any time over a very extensive area.

At Bowen the "Green Fly" (*Jassid*) has been causative of a good deal of damage to the foliage of tomato plants on some farms, and appears to be on the increase, as the infestation, though on the whole not serious, was greater than in the previous year.

In the citrus orchards the *Fruit Fly* and *Orange-piercing moth* have been more prevalent than for many years past.

Land Settlement and Increase in Production.

Though advance in the settlement of land outside the sugar areas has not shown any marked increase, the attention paid to improved methods of cultivation, the use of fertilisers, and the selection of suitable varieties, as well as the increase in the ensiling or otherwise conserving of fodder, give promise of a greater output from existing farms, in which direction the efforts of this Department must be given some credit. Land settlement is accelerated when the inducement is offered of a reasonable degree of success with crops that can be marketed easily and at a cost that will allow of a suitable margin of profit to the grower.

The Tablelands of Atherton and Evelyn and the *Mount Molloy district*, now that a bacon factory is in operation in addition to the butter factories, as well as a pig pool and maize pool, offer perhaps the greatest attraction in mixed farming for further land settlement. Land values in these districts will probably not see a lower level, and are certain to rise steadily with a doubling of present values in a few years.

The Charters Towers and Mareeba districts give promise with cotton as a successful crop, whilst the former under irrigation proves the excellence of its soil and climate for citrus fruit and grapes.

Bowen and Proserpine districts in which cigar-leaf has been profitably grown offer inducements for the extension of that industry either wholly or in conjunction with other crops.

The Cook district, celebrated for its peanuts and late citrus fruits, is hampered in further land settlement by high freights on produce and distance from markets, while the same obstacles to a greater extent operate against the Gilbert River with its great extent of rich alluvials, just as they do to several other Northern districts.

In conclusion, I desire to record my appreciation of the services of Field Assistants Hassell and Straughan, whose assistance has been of great value in experimental work, especially on the Tableland, where the success was largely due to Mr. Hassell's energy and enthusiasm. Mr. Hassell is severing his connection with the Department to take up a more lucrative position with the Maize Pool Board as manager at one of the silos, where his ability and energy will render his services of value.

DAIRYING IN QUEENSLAND, 1924.

By E. GRAHAM, Director of Dairying and Cold Storage.*

The seasonal conditions prevailing throughout the earlier six months of the year were part particularly unfavourable for dairy farming. In fact, there was a continuance for another half-year of the dry weather conditions which characterised the former season. The prolonged dry spell played havoc amongst the dairy stock, and many of the herds were reduced in numbers because of animals dying from starvation. Few, if any, dairy farmers found it possible to carry on dairy farming operations at a profit under circumstances so adverse, as both the dry season and the market value of dairy produce were against them.

General rain fell throughout the areas devoted to dairy farming towards the close of the calendar year, and relief from droughty weather conditions was obtained. As a result of the beneficial rainfalls, there occurred a sharp increase in the quantities of dairy produce manufactured, but the values of dairy foodstuffs remained depressed upon the world's market.

During the first half-year of the season little or no rain fell, but the remaining portion of the season could be accepted as being fairly satisfactory in regard to rainfall and weather conditions generally.

Within the year the production of milk was 104,203,877 gallons. The milk produced was utilised for domestic purposes, or in the manufacture of butter, cheese, or condensed milk.

The particulars supplied hereunder show the disposition of the milk under the various headings, together with the quantities of milk used for similar purposes during the former year:—

Milk Sold for Consumption as Milk.

Year.	Quantity (gallons).
1922	5,061,957
1923	5,217,660
Increase	155,703

Milk Used by Cheese Factories.

Year.	Quantity (gallons).
1922	9,764,933
1923	7,233,079
Decrease	2,531,854

Milk Used at Condensed Milk Factories.

Year.	Quantity (gallons).
1922	2,700,788
1923	2,181,379
Decrease	519,409

Milk Separated for Butter-making Purposes.

Year.	Quantity (gallons).
1922	104,949,114
1923	78,488,319
Decrease	26,460,795

In agreement with established custom, the production of butter claims the largest proportion of the milk raised upon the dairy farms.

Despite the adverse nature of the season, there are indications that dairy farming as a means of livelihood has not lost favour with the settlers on the holdings of comparatively smaller acreage. The principal avenues through which expansion of the industry may be effected are (*a*) by the adoption generally of improved methods of animal husbandry, (*b*) by the utilisation of additional areas of land for dairy purposes. The limitations to the development under those headings are practically unbounded, outside of economic considerations. Naturally, the price obtainable for dairy produce will always remain a controlling factor, and will exercise a material influence upon the expansion of the industry.

* In the last Annual Report of the former Under Secretary (Mr. E. G. E. Scriven) to the Minister (Hon. W. N. Gillies) for submission to Parliament.

Butter.

In referring more particularly to the manufacture of butter, it is found that the total production for the year fell short of that for the former twelve months by some 13,000,000 lb., the decrease being directly attributable to the dry weather conditions, but a return to normal seasons will quickly re-establish the production upon the former satisfactory level.

An improvement in the general quality of butter was effected during the season. The adoption of the principle of neutralisation and pasteurisation of the cream supplies intended for butter-making purposes has been decided upon by practically every company manufacturing butter for exportation overseas, and the output of butter from factories, as a consequence, has been considerably improved in quality, especially in respect to the suitability of the butter for the purpose of the export trade.

The examination of the butters carried out by officers of this branch goes to show that increased skill and care are being bestowed in the manufacture of butter at factories, and instances of over-neutralisation and defective pasteurisation of the cream have been less frequent, and a proportionate decrease has been effected in the number of cases of butters showing minor faults in manufacture. Material advancement has been made in the direction of the improvement of the equipment, plant, and general efficiency of the factories.

The enthusiasm that is being manifested by those in control of factories to bring the manufacturing premises up to a letter-perfect standard of hygiene and efficacy, may be accepted as an indication that there will be a continuance of the improvement in both the appointments of the factory and the efficiency with which the processes of manufacture are carried out.

During the earlier part of the season some of the butters coming forward to market were affected with wood-taint flavour, or by mould growth. Both these faults in butters were made the subjects of investigation by officers of this branch, and factories advised as to the underlying causes, and the remedial measures necessary to be taken for the removal of the defects. The full text of the investigations made in connection with these matters were brought prominently under the notice of those concerned, and, in the case of wood-taint, the co-operation of the proprietors of sawmills supplying butter boxes to factories was invoked, with the object of eradicating the trouble and preventing the probability of a return of the difficulty.

The investigation carried out in regard to wood-taint flavour in butter went to show that (*a*) unseasoned pine timber is unsuitable for butter-box purposes, (*b*) that there is a class of pine timber known as "sinker pine" which is totally unsuitable for butter-box purposes under any conditions. Owners of timber mills have agreed to exercise care in the drying of the pine intended for butter boxes and to discard the use of "sinker" or "brown-heart" pine in butter boxes. Non-compliance with the conditions as set out above will result in Queensland pine being recognised as unsuitable for use in butter-box making.

Another matter affecting the industry generally is the incidence of preservative in butter. The health authorities in Great Britain have instituted inquiry into the growing prevalence of cancer in humans, and the presence of preservative in various forms of foodstuffs has been instanced as a probable cause of the trouble. The findings of the Board appointed to conduct the inquiry into this matter have not yet been made public in Australia, but, as the existing standard of composition for butter for export permits of the addition of not more than half of 1 per cent. of boric acid to butter, this commodity will be brought under the notice of the Board. Naturally, any action taken as the result of the findings of the Board will affect the overseas trade of this State in butter.

Numerous experiments were conducted prior to the general adoption of the principle of pasteurisation of cream, for the purpose of determining the relative keeping properties of butter free from preservative, and that to which preservative had been added in the prescribed quantity. The results obtained under the then existing conditions were conclusive in demonstrating the advantages of boric acid as an agent in the conservation of the quality of butter which was held for many weeks in cold storage preparatory to marketing overseas.

A comparatively small quantity of boric acid is added to butter made in Queensland, the average boric acid contents in butter being .17 per cent.—about one-third of the legal limitation. And there exists a considerable degree of doubt as to whether this small or even an increased amount of boric acid is capable of exercising any useful purpose in butter manufactured from pasteurised cream. Several manufacturers of butter in this State have of their own volition relinquished the use of boric acid; others, again, claim advantages by its use. Experiments on

a comprehensive scale are being conducted with a view of deciding whether boric acid under existing methods of manufacture of butter is useful or otherwise in maintaining quality.

Variance in opinion as to the worth of boric acid is not restricted to Queensland, but extends throughout Australia and New Zealand. The Dominion and several of the States of the Commonwealth champion the use of boric acid. It is possible that the majority of the manufacturers here are inclined to the opinion that the use of boric acid could be dispensed with without occasioning serious injury to the keeping properties of the butters.

No matter what may be the result of the experiments under way at the present time, the objective of a pure food supply should not be lost sight of. In this State the law demands that milk, cream, cheese, and all other edible dairy products (with the exception of butter) shall be free from preservatives; it is admitted that the quantity of added preservative legally allowable is very small in the case of butter, but no opportunity should be missed to place butter too on the list of dairy produce free from added chemical preservatives.

Cheese.

The volume of the production of cheese was affected by the dry weather conditions, and possibly, too, by the market rates for cheese being somewhat relatively lower as compared with butter than is usually the case.

The pasteurisation of milk for cheese purposes is growing in practice, but the number of companies adopting the method is limited, principally on account of the results of sales effected in Great Britain showing that the realisations of the unpasteurised cheeses are frequently equal to, and sometimes at a higher rate than, those obtained by sale of cheeses manufactured from the pasteurised milk.

The companies manufacturing cheese for export declare that an explanation sufficiently satisfactory to them in regard to what appears to be an anomaly in values is not forthcoming, and, until the matter is straightened out, companies are more inclined to continue with their factories equipped in the ordinary manner than to incur the expense involved in the installation of the plant necessary to carry out the pasteurisation of the milk supplies at the factories.

That the adoption of the principle of pasteurisation of the milk supply at cheese factories will sooner or later play an important part in the improvement of the general standard of quality of cheese is positive. The results attained to date are quite satisfactory in so far as improvement in quality is concerned, and have amply demonstrated that certain defective flavours in milk for cheese-making are to be overcome by the subjection of the milk to pasteurisation.

The quantity of cheese manufactured in this State is far in excess of that needed to satisfy the requirements of the local markets, consequently the development of the industry will be governed in no small measure by the market rates prevailing in the overseas markets from time to time. The cheese factories of Queensland contributed practically the whole of the cheese exported to Great Britain during the season.

The market quotations for cheese throughout the season were somewhat lower than usual. It has been claimed by some that the depressed condition of the beef market is to an extent reflected in the values offering for cheese, and they instance that comparatively high values for meat cause attention to be directed towards cheese as a substitute, and the market for cheese firms as a result of the improved demand. This matter aside, the tonnage of cheese imported into Great Britain each year provides adequate evidence that there exists a market capable of absorbing large quantities of cheese, and the requirements of the nation in cheese are for the greater part drawn from abroad. Australian manufacturers contribute only a small proportion of the total of cheese imported into Great Britain, but the trading of cheese with the motherland may be well worthy of further development, and may ultimately grow into a business of great importance.

It was with the view of advertising Australian cheese, and to encourage and foster that branch of trade that those interested in the production of cheese in this State decided to place on exhibition at Wembley a mammoth cheese of slightly more than 1½ tons in weight. Rather more than 3,400 gallons of milk were utilised in the manufacture of the cheese. The cheese was made from milk which had been previously pasteurised, and in this respect a record has been established, as the cheese was the largest in size that has been made from pasturised milk in any country.

The reports to hand indicate that the cheese was one of the principal features of attraction in the dairy section of the Australian Court. The quality, finish, and

PLATE 7. AVENUE OF APPLE TREES (DUNN'S SEEDLINGS) NINE YEARS OLD, ON MR. BALDWIN'S PROPERTY, THULIMBA.
Showing cover crop (barley) along the rows.

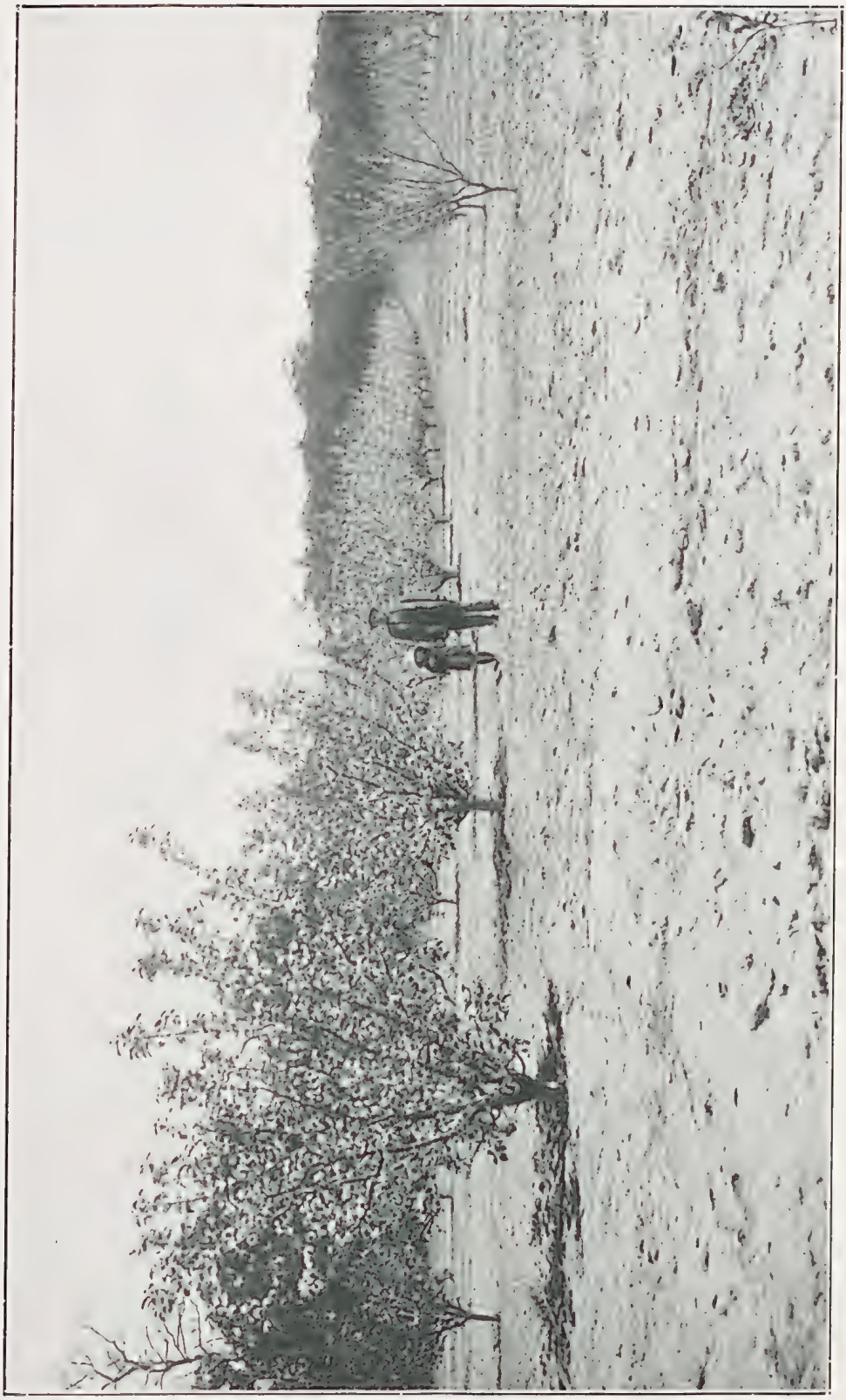


PLATE 8.—APPLE TREES IN BLOSSOM (GRAVENSTEINS) TEN YEARS OLD, ON MESSRS. C. AND B. TEALE'S ORCHARD AT THE SUMMIT,

general appearance of this monster cheese when it was in readiness for shipment from this State were splendid, and reflected great credit upon those responsible for the manufacture and finish of the article.

The making of a cheese of this size called for more than ordinary skill on the part of the cheesemakers, and the mould, press, and most other appliances used were of special size and design as compared with those customarily employed. A special device was necessary to allow of the cheese being turned periodically while it was being matured prior to shipment.

General.

Throughout the year there were received frequent applications from manufacturers for the services of dairy instructors to visit the factory and render assistance in overcoming defects in the quality of the dairy produce, that were more than ordinarily troublesome, or of obscure origin. As a result of the concerted action taken by the manufacturers and departmental officers the source of a number of defects was rapidly discovered, and the cause removed without delay.

The practice of manufacturers and departmental officers working together harmoniously is to be commended, and those relying upon the industry as a means of livelihood have benefited frequently as a result of the co-operation of those parties. Many of the faults in quality of dairy produce arising from bacterial causes (particularly if the factory premises should be the breeding ground of the micro-organism) are more likely to spread than to diminish if allowed to remain unmolested for any length of time; consequently the necessity for prompt and thorough investigation into these matters is obvious, apart from the monetary loss that is occasioned by the manufacture of butter or cheese of inferior quality over an unduly lengthy period.

Under "*The Dairy Produce Act of* 1920," standards are prescribed for the ingredients added in the manufacture of dairy produce; also the materials used in connection therewith. During the year samples of salt and other ingredients were taken for the purpose of analysis. A number of the brands of salt from which samples were taken were of Australian origin. The result of the analysis made by the Agricultural Chemist (Mr. J. C. Brünnich) goes to show that almost without exception the Australian salts were of superfine quality, and conform with the standard prescribed under the Act for superfine dairy salt.

The marked improvement which has been effected in the quality of Australian dairy salt is most satisfactory. As the result of the changed process of manufacture, the sodium chloride content of Australian salt has been increased from 95 to higher than 99.5 per cent. The percentage of foreign matter in salt has been reduced to vanishing point. The need for dairy factories to look abroad for a high-class dairy salt no longer exists.

The results of the analyses of samples of boric acid revealed that some parcels of the commodity were unsuitable for addition to butter, and the use of the boric acid found to be defective as a preservative for butter was prohibited accordingly.

A number of samples of grease-proof parchment paper intended for the purpose of wrapping butter were analysed. As a result of analysis a number of the papers were found to contain loading matter, which is in contravention of the Act. The use by dairy factories of wrapping paper not conforming with the requirements of the Act was not permitted.

It is anticipated that the construction of the Government Cold Stores, situated near the Hamilton Reach of the Brisbane River, will be completed and the stores placed in readiness to accept primary products for cold storage towards the close of the calendar year. As mentioned in previous reports, the cold stores will be utilised for the purpose of storage of such primary products as require to be held at artificial temperatures in order to enhance their keeping properties. Amongst the principal commodities for cold storage will be included butter, cheese, eggs, and fruit.

Little or no progress has been made in the matter of conservation of fodder upon the dairy farms. Admittedly the seasonal conditions prevailing for several years past have not been conducive to the growth of fodder crops, which is one of the initial steps towards systematic fodder conservation. The losses inflicted upon the dairy farmers by droughty weather conditions are adequate to demonstrate the necessity for action which will either remove entirely or modify the influences of prolonged dry spells—robbing the dairy farmer, as they do, of his chance of deriving any revenue from his dairy farm for the time being, and frequently causing devastation amongst the dairy herd.

The problem is one of considerable magnitude, and one to which there is not readily to be found a practical solution. The matter has been taken up for consideration by the Council of Argiculture. It is possible that the primary producers, now

organised, may later be prepared to subscribe to some system of fodder conservation which will by its application do much towards preventing a glut in the fodder market in bountiful seasons with the consequent depression of values, and on the other hand permit of the placing in reserve supplies of fodder to be drawn upon when seasonal conditions are adverse and the soil temporarily ceases to produce.

The breeding and feeding of dairy animals are correlated, and if the adage of "no feed, no milk" is sound in practice, it might justifiably be claimed that the importance of providing adequate supplies of fodder for the dairy herds is a paramount consideration to that of breeding. Both breeding and feeding are essentials in successful dairying; let us strive to attain them.

Owing to the indifferent season experienced in the year 1923, and the consequent shortage of pasture and other fodder, the same class of cows that produced 151,000,000 gallons of milk in the year 1921 failed to produce little more than 104,200,000 gallons of milk in the year 1923. During both periods the number of dairy cows employed was approximately equal, and there is no reason to suggest that the methods of animal husbandry differed appreciably within the years stated; consequently the deduction is that feeding is one of the major factors in milk production.

Throughout the year several hundreds of pedigree dairy cows were submitted to a butter-fat test, either for the purpose of qualifying for permanent registration of the test records in the Herd Book, or to qualify for registration in the Advanced Register of the recognised distinctive breeds of dairy stock. In these cases the particulars relative to the animals to be tested are submitted to this office by the secretary of the particular pure breeders' associations that is concerned, and the supervision of the milking of the animals and the conduct of the testing operations are carried out by officers of this branch.

Every distinctive breed of dairy cattle has a separate and independent association, which controls the affairs of the owners or fanciers of that special breed in so far as the recording of pedigrees and test results and other incidental matters are concerned. The various associations some years ago decided to record only the test results which have been carried out under the supervision of departmental officers—that is to say, only official test results are recognised by the associations.

It is pleasing to note that every year there takes place a substantial increase in the number of purebred cows which are submitted to the long-distance or 273-days test. Splendid records in production have been made by some of the cows drawn from the recognised dairy breeds. It is the test results of animals over the nine-months' period which decides the worth of a cow from the dairy farmer's viewpoint; dairy farmers, as a rule, are not seriously impressed by the performance of a cow under test for a twenty-four-hours' period, even if the production is more than ordinarily high. It is from the progeny of the purebred stock, buttressed by accredited butter-fat production over an extended period, that the dairy farmer considers he can with a degree of confidence select an animal capable of effecting improvement in the production of his herd.

Apart from the testing of animals entered in the Herd Books, a comparatively greater amount of testing has been carried out amongst the dairy herds comprised of ordinary or grade cows. Increased interest in this work is being taken by dairy farmers, and cows to the number of 12,400 have been submitted to a test during the year. These figures compare favourably with those of last season, during which 9,100 cows were tested, a comparative increase of 3,300 in number, or rather more than 33⅓ per cent. Had the season been more favourable, a proportionately greater number of dairy herds would have been submitted for testing. A number of local producers' associations signified their desire to have their cows subjected to a test for butter-fat, but refrained from so doing until normal seasonal conditions again prevailed.

The local producers' associations, in dairying districts particularly, are exhibiting keener enthusiasm in the matter of herd-testing, and many have voiced their appreciation of the manner in which the testing has been carried out, and have endorsed the scheme generally.

Appended are particulars taken from the reports of the Senior Herd Tester (Mr. L. Andersen), together with a summary of the test results in the various localities wherein testing operations were carried out.

The winter was exceptionally long and cold, with westerly winds prevailing over long periods. Losses of dairy stock were reported from all districts during the late winter and spring, and had the drought lasted much longer the position would have been very serious indeed. Herd-testing operations were necessarily very much hampered by the adverse conditions, and for a time the work practically ceased. The drought finally broke in December, and during the second half of the year the testing staff was kept busily engaged.

PLATE 9.—PEAR TREES IN BLOSSOM (30 YEARS OLD) ON MR. SMITH'S FARM, BROADWATER, STANTHORPE.

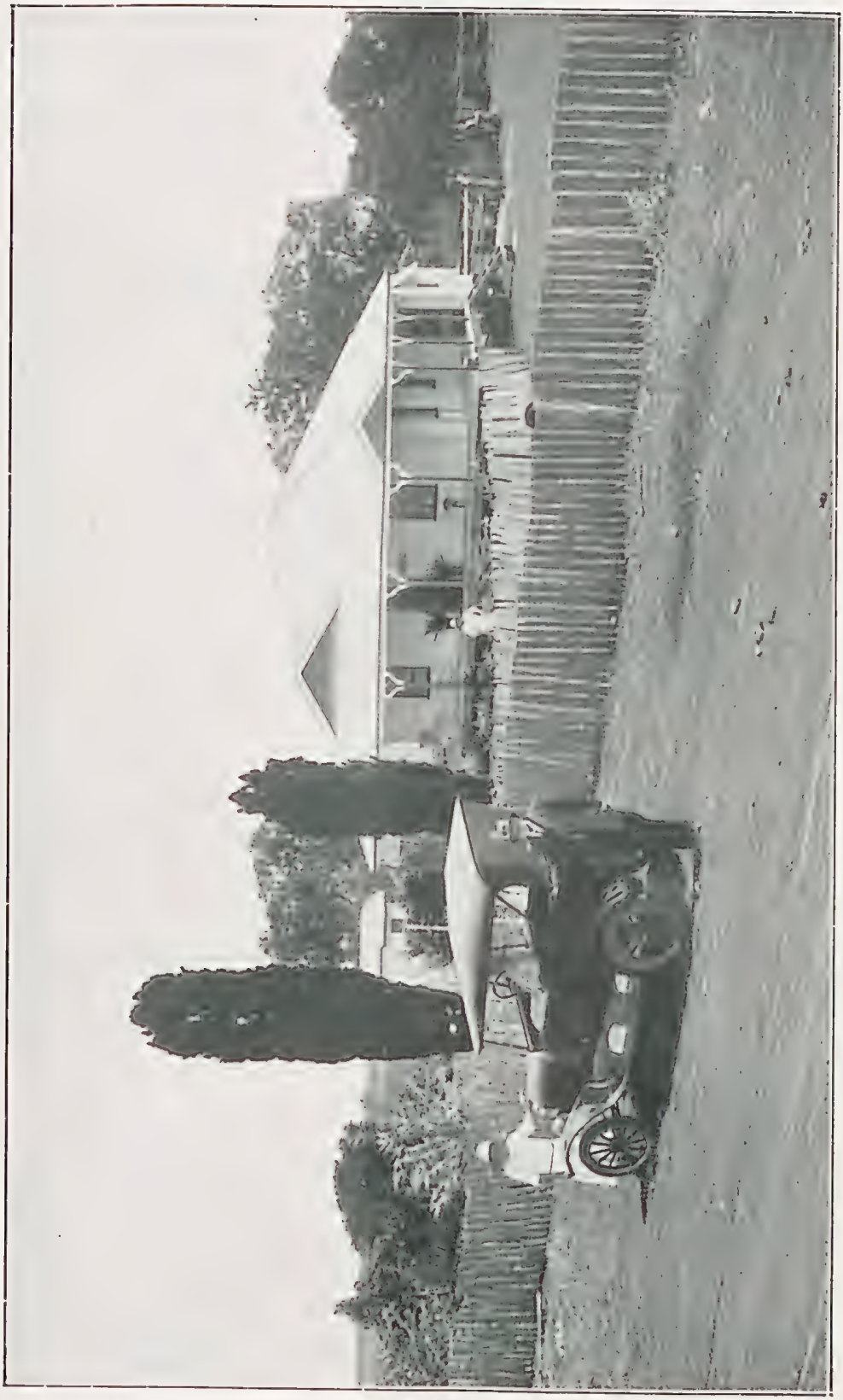


PLATE 10.—THE HOMESTEAD, MR. H. GEITZ'S FARM, ALLORA, GOOMBURRA LINE.

Inquiries came early in the new year from branches of local producers' associations and from different districts in the State, the principal of which were as follows:—

North Coast Railway.—Cooroy, Green's Creek, Wolvi, Ross Creek, Widgee, Tamaree, Gunalda, Tiaro, and Mount Larcom.

Kingaroy Branch.—Woolooga, Manyung, Boat Mountain, Speedwell, Wondai, Tingoora, and Wooroolin.

Gayndah Branch.—Woowonga, Coalstoun Lakes, Degilbo, Gooroolba, Byrnestown, Reid's Creek, Binjour, Woodmillar, and Riverleigh.

Darling Downs.—Kingsthorpe, Oakey, Djuan, West Haldon, and Millmerran.

West Moreton.—Kalbar, Mutdapilly, and Palen Creek.

During the year a total of 512 herds were submitted, comprising 12,413 cows. This constitutes a record since herd-testing was inaugurated by this Department, and taking into consideration the fact that only 948 cows were dealt with during the first half of the year, it would appear that the farmer at last realises the advantages of herd-testing.

From the district reports attached it will be seen that most of the work during the season just ended was carried out in the North Coast and Burnett districts, while in West Moreton and Darling Downs, our oldest and most settled districts, only 1,525 cows were submitted, representing only 12 per cent. of the total number tested. It is difficult to understand why farmers in these older districts fail to realise the importance of dairy herd testing. In order to arrive as near as possible to the production of each cow in each individual dairy herd, it has been the policy of this branch to visit each district at intervals of two months.

Some centres have shown very keen interest, and most of those favoured with fair average weather conditions have tested over the whole period, while others, due mostly to the conditions of pastures, have been unable to complete the season. This aspect presents itself year after year, and still there is little or no evidence of advancement in fodder conservation. I regret to have to state that during the year I have not seen one new silo being erected. Dairy farmers still pin their faith to green feed of various kinds, and, while it is admitted that this may be the cheapest way of feeding dairy stock in good seasons, continued failures of this method during recent years should bring home the fact that the time has arrived when more silos should be erected throughout our dairying districts, in order to guarantee a constant supply of fodder for dairy stock during winter months and dry spells, which are unfortunately only too common in this State.

As in past years, every opportunity has been afforded the dairy farmer to gain a knowledge in milk and cream testing; as a rule the owner generally remains while his samples are being treated, and at several centres public demonstrations have been carried out. As usual the Babcock tester has been the means of discovering many unprofitable animals during the year. The old favourite in the dairy herd has often been deposed, while cows not previously recognised have been proved to rank among the best in the herd.

Numerous samples of skim milk have been treated, and, while in most instances good work has been performed by the separator, there have been cases where big losses have occurred of which the owners were entirely ignorant. Losses of this kind are often rectified by causing increased speed of the separator bowl by the addition of one or more dishes in the bowl.

The daily average yield of milk is shown as 14.03 lb., while the highest recorded for an individual cow is 48 lb. per diem; hence it will be seen that out of a total of 12,413 individual animals not one reached the 5 gallons per day. The mean daily production of butter-fat of all cows tested is recorded as .59 lb., while the best herd average shows a return of 1.32 lb. daily.

Applying these figures to two herds A and B respectively, each containing forty cows and extending over a lactation period of 300 days, the following figures are disclosed:—

Herd A shows a production of 7,080 lb., while Herd B in the same period gives a return of 15,840 lb. butter-fat.

Taking butter-fat at 10d. per lb., Herd A gives a return of £295, as against £660 for Herd B, a difference of 123 per cent. in favour of the latter herd.

The mean average fat per cent. of all cows tested, 4.2 per cent., is the same as last year. Individual fat tests show a wide range from 1.6 to 10 per cent., while the highest and lowest average in a herd was 6.17 and 3.21 per cent. butter-fat respectively.

HERD TESTING, 1923-24.

DISTRICTS.

District.	Month.	Number of Herds Tested.	Number of Cows Tested.	Average Daily Production of Milk.	Average Fat, per cent.	Average Daily Production of Butter Fat.
				Lb.		Lb.
NORTH COAST RAILWAY.						
Cooroy ..	August ..	14	357	8·6	4·2	·41
Cooroy ..	December	16	429	11·8	3·9	·46
Cooroy ..	February	10	317	14·0	4·1	·57
Cooroy ..	April ..	8	204	14·4	4·04	·58
Green's Creek	March ..	7	226	16·6	4·34	·72
Wolvi ..	February	8	244	13·36	3·96	·52
Wolvi ..	April ..	8	285	10·93	4·51	·49
Ross Creek ..	March ..	7	155	16·13	4·05	·65
Widgee ..	February	7	263	17·83	3·84	·68
Widgee ..	April ..	15	561	14·5	4·45	·64
Tamaree ..	May ..	9	162	9·33	4·92	·45
Gunalda ..	January	21	491	15·94	3·7	·59
Gunalda ..	March ..	12	302	18·09	4·25	·76
Tiaro ..	February	12	266	17·5	3·9	·68
Mount Larcom	September	6	97	10·55	4·1	·51
Mount Larcom	June ..	14	303	9·74	4·84	·47
Buderim ..	January	1	17	16·7	3·84	·64
Buderim ..	April ..	1	24	15·5	3·6	·54
Average ..	..	176	4,703	13·97	4·14	·58
GAYNDAH LINE.						
Coalstoun Lakes	January	6	198	23·0	3·9	·89
Woowoonga ..	January	7	166	14·5	3·5	·51
Degilbo ..	January	6	122	14·25	3·65	·52
Degilbo ..	April	6	131	15·3	4·15	·63
Gooroolba ..	January	18	476	17·5	3·9	·68
Gooroolba ..	March	16	405	14·4	4·2	·60
Byrnestown ..	September	4	65	10·0	4·0	·40
Byrnestown ..	January	11	194	17·5	3·9	·68
Byrnestown ..	April	9	194	16·3	4·2	·68
Byrnestown ..	June	5	66	8·39	4·7	·39
Reid's Creek ..	February	13	366	17·0	3·9	·66
Binjour ..	June	14	271	11·33	4·58	·52
Woodmillar ..	January	10	315	20·5	3·85	·79
Woodmillar ..	March	6	224	18·8	4·2	·79
Woodmillar ..	June	4	94	10·67	4·75	·50
Riversleigh ..	April	10	209	12·8	4·25	·54
Average ..	..	145	3,496	15·00	4·10	·62
KINGAROY LINE.						
Woolooga ..	March ..	5	131	17·0	4·3	·73
Woolooga ..	May ..	1	20	9·2	5·1	·47
Manyung ..	February	8	331	17·4	3·9	·68
Manyung ..	April ..	7	276	13·5	4·5	·61
Manyung ..	June ..	5	145	8·1	4·4	·36
Tableland ..	April ..	13	420	16·0	4·4	·70
Speedwell ..	February	8	119	16·0	4·0	·64
Wondai ..	February	35	641	19·56	4·1	·81
Wondai ..	April ..	11	193	13·8	4·58	·63
Tingoora ..	March ..	7	125	20·4	4·2	·84
Tingoora ..	May ..	1	24	11·3	4·7	·53
Wooroolin ..	March ..	7	130	20·8	4·1	·85
Wooroolin ..	May ..	3	34	17·2	4·06	·70
Average ..	...	111	2,589	15·38	4·33	·66

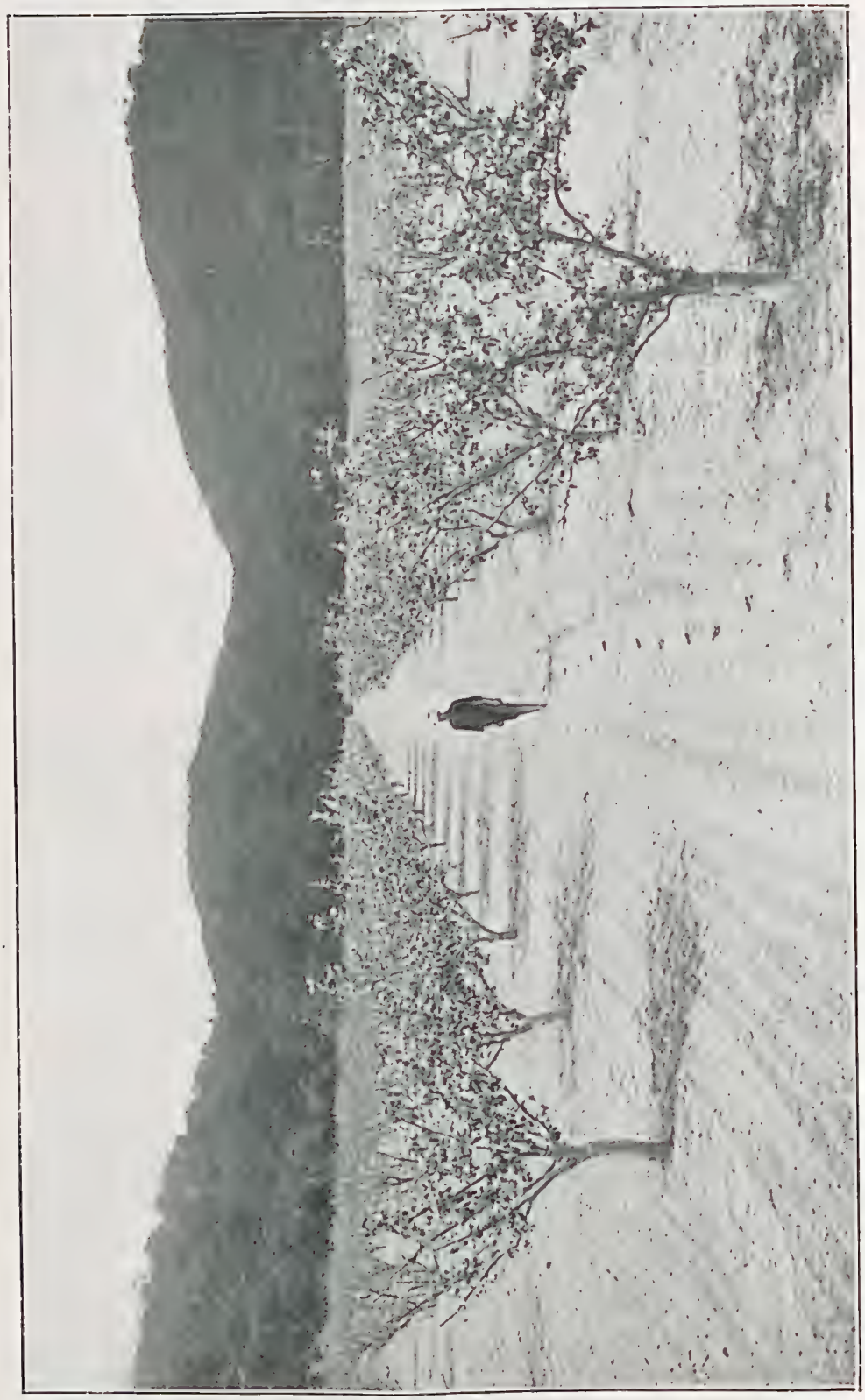


PLATE 11.—APPLE TREES IN BLOSSOM ON MR. COWLEY'S ORCHARD AT BALLANDEAN.

PLATE 12.—A QUEENSLAND WHEATFIELD—WHAT WILL THE HARVEST BE?

HERD TESTING, 1923-24—*continued.*

DISTRICTS—*continued.*

District.	Month.	Number of Herds Treated.	Number of Cows Treated.	Average Daily Production of Milk.	Average Fat, per cent.	Average Daily Production of Butter Fat.
				Lb.		Lb.
WEST MORETON.						
Kalbar ..	February	6	114	19·7	4·02	·79
Mutdapilly ..	May ..	10	202	9·9	4·4	·43
Palen Creek ..	May ..	8	218	8·8	4·4	·39
Average ..	..	24	534	12·8	4·27	·55
DARLING DOWNS.						
Kingsthorpe ..	May ..	13	176	16·4	4·3	·71
Oakey ..	March ..	7	142	13·43	4·63	·62
Djuan ..	March ..	12	310	17·8	4·0	·71
West Haldon ..	May ..	9	189	12·6	4·6	·58
Millmerran ..	May ..	15	274	13·7	4·3	·59
Average ..	..	56	1,091	14·78	4·36	·64

GENERAL AVERAGE ALL DISTRICTS.

——	Year.	Number of Herds Tested.	Number of Cows Tested.	Average Daily Production of Milk.	Average Fat, per cent.	Average Daily Production of Butter Fat.
				Lb.		Lb.
General Average	1923-24..	512	12,413	14·03	4·20	·59

SUMMARY OF YEAR'S OPERATIONS.

Number of Herds Tested ..	512	Amount of Milk Yielded by Individual Cow Daily—	lt.
Number of Cows Tested ..	12,413	Highest	48
Daily Yield of Milk in Tested Herds—	lb.	Lowest	1
Mean	14·03		
Highest	28·4		
Lowest	5·0		
Butter Fat Content of Herd Milk—	per cent.	Amount of Butter-fat Yielded by Individual Cow Daily—	per cent.
Mean	4·20	Highest	1·87
Highest	6·17	Lowest	0·05
Lowest	3·21		
Daily Amount of Butter-fat Produced in Herd—	lb.	Butter-fat Content Recorded—	
Mean	0·59	Highest	10·0
Highest	1·32	Lowest	1·6
Lowest	0·21		

The inspection of dairies and dairy produce premises has been carried out, as provided for under "*The Dairy Produce Act of* 1920," by inspectors appointed under the Act. *Inter alia,* the Act has as an objective the adoption of a higher standard of hygiene upon all premises where dairy produce is raised, treated, manufactured, or stored.

The observance of improved methods of sanitation by those directly concerned in the actual production or manufacture of dairy produce was imposed first because of the necessity to safeguard the health of the consumers of dairy products as far as practicable, protecting especially that section of the community that is reliant principally upon milk or milk foods as a diet, and secondly because it is essential that the produce of this State shall be at least equal in purity and quality to the dairy products placed on the world's markets by countries competing against us in the overseas trade. While the inspectors have to share the responsibility of seeing that the requirements of the Act are complied with on the dairy farms, the officers act more generally in the capacity of instructors to dairy farmers, and discuss with and advise them upon the many matters associated with dairying that come up for consideration from time to time.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1924 AND 1923, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1924.	Nov., 1923.		Nov.	No. of Years' Records.	Nov., 1924	Nov., 1923.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	1·92	23	6·79	0·93					
Cairns	3·95	42	7·01	0 43	Nambour	3·83	28	4·20	5·54
Cardwell	4·01	52	8·47	0·22	Nanango	2·52	42	5·86	0·86
Cooktown	2·65	48	4·09	0·03	Rockhampton ...	2·18	37	3 83	2·51
Herberton	2·29	37	10·02	0·85	Woodford	3·14	37	2·95	1·75
Ingham	3·62	32	3·01	0·05					
Innisfail	6·11	43	9·89	0·64					
Mossman	4·29	15	6.43	0 57					
Townsville	1·78	53	5·83	0·34	*Darling Downs.*				
					Dalby	2 62	54	4·14	2·35
Central Coast.					Emu Vale	2·60	28	4·27	2·17
					Jimbour	2 28	36	3·49	0 96
Ayr	1·73	37	2·05	0·24	Miles	2·37	39	4·45	0·18
Bowen	1·27	53	3·59	0·13	Stanthorpe ...	2 67	51	5·95	0·14
Charters Towers ..	1·50	42	1·49	0·06	Toowoomba ...	3·20	52	5·52	1·74
Mackay	2·86	53	6·10	1·32	Warwick	2·52	59	4·08	0·99
Proserpine	2·76	21	5·05	...					
St. Lawrence ...	2·28	53	2·39	0·66	*Maranoa.*				
South Coast.					Roma	1·97	50	6·72	0·22
Biggenden	2·63	25	3·82	1·79					
Bundaberg	2·51	41	4·03	1·34	*State Farms, &c.*				
Brisbane	3·74	73	6·29	1·23					
Childers	2·75	29	3·63	1·90	Bungeworgorai ...	1·69	10	...	0·16
Crohamhurst ...	4·39	30	4·21	3·85	Gatton College ...	2·58	25	3·93	1·84
Esk	3·11	37	3·98	2·26	Gindie	1·99	25	5·10	0·54
Gayndah	2·78	53	4·14	1·79	Hermitage ...	2·53	18	4·56	0·89
Gympie	3·15	54	2·19	3·63	Kairi	1·93	10	4·39	1·92
Caboolture	...	...	3·25	...	Sugar Experiment Station, Mackay	2·50	27	5·91	0·23
Kilkivan	2·57	45	3·47	2·30	Warren	3·09	10	3·51	1·47
Maryborough ...	3 08	53	4·36	2·12					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for last November, and for the same period of 1923, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
State Meteorologist.

THE COLD STORAGE OF FRUIT.

A paper prepared by Sir Geo. Knibbs, K.B., C.M.G., Director of the Institute of Science and Industry, and read at the recent Annual Conference of the Fruit-growers' Cool Stores Association of Victoria.

One engaged in any particular one of this world's activities is apt, owing to its demands for concentration, to see it out of proper perspective in the totality of human affairs. For this reason, it is well when those engaged on the scientific and the practical sides foregather. Thus those not engaged directly in an industry may sometimes be helpful to those actually engaged in it. In any case, it will be of interest to express one's point of view.

From time immemorial man has continually been forced to see the necessity for the storage of food, and (perhaps too often?) this has involved various devices for its preservation. In the course of time many methods have been evolved; to mention but a few of them we have smoking, drying, salting, preservation with chemicals, and what perhaps is of more direct interest to us now—storage at low temperatures. This last is one of the most satisfactory of methods, involving as it does no serious alteration of the properties of the fresh material.

Our ancestors were often desirous of a cheap process of producing cold. It is only within the last few decades, however, that this has been possible, and so one of the first attributes of the cold storage industry, apparent to a mere observer, is its comparative youth. On this account it is a most likely field to repay intensive scientific research. In this connection also it may be remarked that when carrying out investigational work relating to a new industry it is a wise policy to give free rein to the imagination. In the older industries, research sooner or later becomes limited to more or less restricted avenues.

Following the introduction of methods of cold storage, it was soon found that they were efficacious in either completely stopping or retarding the rate of deterioration by reason of their checking the growth of attacking organisms, and it has, of course, long been known that—within certain limits, and speaking generally—the lower the temperature the greater the amount of this arrest. Some foods, however, do not admit of an indefinite lowering of temperature without a parallel loss of texture, flavour, &c., a matter of very great commercial import.

These changes of texture not unfrequently occur quite suddenly, directly such foods are thawed after storage at a temperature below their freezing points. On this account it is convenient to divide foods into two classes—

(*a*) Those that can be frozen and then thawed without serious changes in their texture, flavour, appearance, &c. (as compared with the unfrozen material).

(*b*) Those that cannot be so treated without serious changes taking place.

In other words, class (*a*) consists of foods which are now stored on a commercial scale in the frozen condition, and class (*b*) consists of those which, in commercial practice, are maintained at a temperature of about 32 deg. F. or over, *i.e.*, those that are merely "chilled."

Freezing, of course, is much more potent in inhibiting decay and the growth of organisms than is mere chilling. So great is this difference and so many are the advantages of freezing that it might well be laid down that the main aim of cold storage research should be a continual striving to transfer all foods from the chilling class to that of the freezing class.

In this connection it is well known that fruit is typical of the chilling class, whereas meat, such as lamb, mutton, and poultry, is usually frozen. Beef is perhaps in a transitionary stage. When frozen and then thawed a certain amount of liquid or "drip" exudes from any cuts that may be made in the thawed products. Microscopical investigations have shown that this drip is probably due to the partial separation of water from the cells of the meat during the freezing process.

Workers in other countries have also found that very rapid freezing tends to prevent this separation, and from this discovery it is hoped to evolve a commercial process for the freezing of beef. In this connection it might be mentioned that a small amount of experimental work on beef freezing is already being done at the Government Cool Stores, Victoria Dock, Melbourne.

It is not pleasant, however, to have to record that the investigators are working under many difficulties, and that it is only through the co-operation of the Australian National Research Council, the Institute of Science and Industry, and the Victorian Agricultural Department and the Melbourne University and others that it has been possible to do anything at all, although the research is of great national interest.

* * * * * *

Fruit when frozen in the ordinary way, and then thawed, suffers a far more serious loss of its juice content than does beef, and the final product is quite unlike the fresh material. It is most unfortunate that this is so, as the juice itself, when stored at 0 deg. to 15 deg. F., can be kept without deterioration for long periods, and doubtless fruit itself could be so stored if some means could be found to prevent its juice escaping. The leakage of juice on thawing is brought about as a result of damage to the cell structure of the fruit, and it might be well at this stage to consider briefly how the flesh of fruits is made up. From a chemical point of view a considerable amount of information is available, and much work of this nature has been carried out by the United States Agricultural Department's Bureau of Chemistry.

For the peach, when ripe, average figures of this Bureau are:—Flesh, 92 per cent. of the total weight; this flesh being made up of Marc, 2.5 per cent., reducing sugars, 2.0 per cent.; sucrose sugar, 6.0 per cent.; acid as H_2SO_4, 0.56 per cent.; the total of these being 11 per cent. The remaining 89 per cent. is chiefly water.

The composition of other fruits is of a very similar character. The flesh is made up of minute cells, which contain the greater part of the fruit juice. This latter, however, is by no means simple in its composition, and consists chiefly of water holding in solution such soluble materials as varieties of sugars, inorganic salts, &c. Colloids, such as proteins, dextrines, and other complex organic compounds, are also present, and perhaps still other materials occur as suspensions.

A rather important point is that the juice is in equilibrium with the cell wall, both chemically and physically. This fact has been brought out by Demoussey,* who has subjected fruits to a series of increasing pressures, and analysed the juice at each expression. As a result of this treatment he concludes that the difference in the physical structure of the cell of any particular fruit is accompanied by a difference in the chemical composition of its contents. There is a certain amount of localisation, but it is not the same for all fruits. Sometimes it is the least resistant cells that are poorest in acids and sugars, and at other times the reverse is the case.

Let us now endeavour to follow what happens when the content of any particular cell is subjected to an ever-increasing degree of cold. Few changes take place until a temperature slightly below 32 deg. F. is reached. Ice then begins to separate out, and this at once upsets the equilibrium of the cell wall and its contained liquid. The latter becomes more and more concentrated—a change inevitably accompanied by important effects, such as the increase of osmotic pressure, &c.

As more and more ice separates, the materials in solution or suspension also begin to be salted out, either as eutectics or as the simple compounds. On thawing, all the substances capable of going into true solution again dissolve, and as far as they are concerned the juice is reformed, but in many cases freezing of colloidal solutions causes separation of the solid colloid in such a way that on thawing it does not again go into colloidal solution. Thus it is possible that some of its former colloidal contents are not returned to the thawed fruit juice.

In this connection it is of interest to consider the work that has been done on the freezing and thawing of some simple colloidal solutions. Much of this work is discussed in the British Food Investigation Board, Special Report No. 7, written by Dr. W. Stiles. In the first place, it appears that on thawing these solutions their reversibility is affected by the presence of either "protective colloids" or of electrolytes. Thus a frozen colloidal solution composed of ferric hydroxide and water is reformed on thawing, provided electrolytes are present. If these are removed by dialysis before freezing then the solution becomes irreversible. Again, the rate of freezing has an important effect on the reversibility. Thus Stiles, working with a colloidal solution of chlorophyll, found that the more rapidly frozen solutions were reformed on thawing, while in those most slowly frozen the chlorophyll aggregated into comparatively large flocks, which were visible as such in the solid mass of ice. On thawing the latter the flocks of chlorophyll gradually collected together at the bottom of the vessel, leaving a clear liquid above. Intermediate freezing velocities caused only a partial separation.

There are indications that the rate of thawing also exercises an effect on reversibility, *e.g.*, a solution of gelatine and water is colloidal in properties, and on freezing forms a highly complex network in which the meshes enclose little masses of ice. On thawing quickly the network remains for many days, but in time it disappears and the original solution is apparently regenerated. These differences between rapid and

* International Review of Agriculture, 1916, p. 53.

slow freezing are also borne out in an interesting way in experimenting with living organisms.

Thus Stiles mentions an experiment of Kuhne, in which a staminal hair of *Tradescantia virginica* was cooled in such a way that it froze practically instantaneously. The temperature used was -14 deg. C., and it was maintained at that temperature for five minutes, yet on thawing it again lived. On the other hand, Molisch, working with the same genus, but freezing staminal hairs slowly, was unable to find any life on subsequent thawing. In passing, it may be mentioned that it has also been found possible by Kahm to freeze small animals without killing them.

Thus air-dried moss containing small rotifers and nematodes has been subjected for seven hours to helium gas at as low a temperature as -150 deg. C. This treatment, of course, freezes such small organisms extremely rapidly, but on thawing they recover, are alive, and show no sign of injury.

If such apparent impossibilities can be done with animals, might it not well be asked whether the last word has been said in regard to the freezing of fruit? Before leaving this aspect of cold storage, I would emphasise that the rate of thawing, as well as that of freezing, exerts an important effect. Perhaps in the past too little attention has been given to the problem of correct thawing.

* * * * * *

Passing on to the "chilling" of fruit, we are at once in a field in which much experience, practical and otherwise, has already been gained. The chilling merely results in altering the rates of the many reactions that go on in the living fruit, or, in other words, it does not kill the fruit, but merely causes it to live at a slower rate. This last statement is perhaps not strictly true, as the effect of temperature affects certain of the reactions that take place to a greater extent than it does others; consequently cold storage fruit is not always absolutely identical with ordinary stored fruit of the same degree of ripeness; for instance, it has been demonstrated in England that the sugar contents of apples from ordinary storage is consistently higher (in spite of their more rapid respiration) than that of apples in cold storage.

Years ago Molisch pointed out the same thing in a more general way when he stated that the different processes in plant organs are inter-related, and if the velocities with which these processes occur are altered in different degrees (as by temperature), then the equilibrium is disturbed.

A very good illustration of the effect of chilling on fruit is obtained from a consideration of their respiration. It has long been known that fruit, even when on the tree, absorbs oxygen and gives off carbon dioxide, and that this takes place at the expense of its carbohydrate content. In other words, the fruit breathes, the action of which consists of an oxidation of carbohydrates, chiefly sugars, into carbon dioxide and water.

This respiration is a phenomenon which has been much studied. It has been found that as soon as the fruit is picked, and as ripening proceeds, respiration generally increases in amount, but in the later stages of maturation it decreases.

In the case of the apple, the British Food Investigation Board has found that the rate of CO_2 produced at the maximum is about half as fast again as when the fruit is first gathered, and that this holds true no matter at what temperature the fruit is stored. The same authority also finds that the time taken to reach this maximum is definitely a function of the temperature of storage, *e.g.*, in apples maintained at 22.5 deg. C. it is 7 days, at 10.0 deg. C. 28 days, and at 2.5 deg. C. 180 days.

Respiration throws yet more light on the nature of the changes that take place in ripening fruit. Some years ago Gore, of the United States Bureau of Chemistry, investigated the amount of carbon dioxide given off by various fruits at different temperatures. He found that if yo—the respiration or the amount of CO_2 given off per unit time at 0°C, and y = the corresponding value at t°C., then log y = log yo— a t, where "a" is a constant which does not vary very much for different fruits, its average value being 0.0376. If in this equation we make t = 8 deg. C. it becomes

$$\log y = \log oo - 0.3008.$$
$$= \log yo - \log 2, \text{ very approximately.}$$
$$= \log (2yo);$$

in other words, from every 8 deg. C. rise in temperature, the rate of respiration is almost exactly doubled.

The respiration of plant-products other than fruits is similarly affected by the temperature, and in this connection Van't Hoff has stated that the effects of a rise in temperature on the rate of respiration of wheat, and on the rate of increase of chemical reactions with temperature, are similar. As Gore points out, the fact that the respiratory processes of fruits follow the same rule as do chemical reactions, is of great significance, indicating as it does that the fundamental life processes of fruits are of a chemical nature.

The theory that respiration, and indeed that the whole process of the maturing of fruits, is of a chemical nature, has led in the past to the introduction of many methods of fruit preservation, and in the future should lead to many more.

For example, it requires but a simple deduction from the chemical law of mass-action to arrive at the conclusion that a decrease of the concentration of oxygen should result in a decrease of the respiration rate; also that an increase in the carbon dioxide concentration should result in the same thing.

This conclusion is the basis of the British Food Board's so-called "gas storage" of apples. The atmosphere they use is one of 8 per cent. oxygen, 14 per cent. carbon dioxide, and the remainder nitrogen. It has been found that keeping apples in such an atmosphere doubles their storage life.

In the case of either apples or of certain other fruits, however, it has not been found practicable to use an atmosphere containing no oxygen, as respiration then becomes controlled by other actions, probably enzymatic in nature, and alcoholic fermentation takes place to such an extent that the flavour is seriously impaired.

In this connection it is interetsing to note that certain varieties of plums are exceptional, as they can tolerate a low percentage of oxygen for a considerable period, and yet develop no alcoholic fermentation.

In the case of apples, it is also not possible to increase the concentration of carbon dioxide indefinitely, as otherwise brown-heart or other physiological disturbances quickly result.

Many other chemical changes take place on ripening or maturing fruit, and all have a bearing on its cold storage properties. To briefly mention the more important of these changes we have the slow hydrolysis to sugar, chiefly sucrose, of the starch which occurs in the green fruit. This change is practically complete when the fruit is ripe. We have also the yet slower hydrolysis of the pectin forming bodies which are chiefly present in the walls of the cells, the almost imperceptible lessening of the acid content, and the gradual increase in softness of the flesh.

* * * * * *

Another most important material, present in fruit and which has not yet been mentioned, is the class known as the enzymes. These exert a most powerful influence on the rate of the changes just mentioned, and also on the rate of respiration. The enzymes are very complicated organic substances, the mere presence of which suffices to hasten or retard a particular chemical reaction. In other words, they are organic catalysts. They have definitely been shown to be present in many fruits. Thus in the case of the apple, Thatcher (Journal of Agriculture Res. 1915, p. 103), finds that diastase, the starch hydrolysing enzyme, is absent; that invertase is also absent, and to this fact is due the non-conversion of sucrose into invert sugars; that a small amount of an esterase capable of hydrolysing ethyl malonate is present; and that a protease which slowly hydrolyses the proteins is also present. As is well known, the apple also contains an oxidase, to the presence of which is due the rapid oxidation or darkening of the surface which is so noticeable when a specimen of this particular fruit is cut.

The enzyme content of fruit has also been investigated by the British Food Investigation Board, which proposes to divide fruit into two classes.

The first class comprises the apple, quince, pear, plum, cherry, peach, apricot, strawberry, banana, grape, fig, and mulberry.

This division contains two enzymes—a peroxidase and an oxygenase—together with a substance containing the catechol grouping. The oxygenase catalyses the oxidation of the catechol with the formation of a peroxide, which is then decomposed by the peroxidase with the liberation of active oxygen. Hence the system can transfer oxygen from the air, and after the death of the fruit (as by freezing) it becomes uncontrolled and very serious and rapid destructive oxidation takes place.

The second class comprises the orange, lemon, grapefruit, raspberry, blackberry, red currant, black currant, gooseberry, pomegranate, pineapple, melon, and tomato. These fruits contain only a peroxidase, and hence there is no system for the transference of oxygen after death.

It has been found that the only fruits which can be kept in a satisfactory condition when frozen in contact with air are those of the second class.

The enzyme content of the different fruits varies considerably, and perhaps this is one of the causes of the great differences in their behaviour in cold storage, and in their rates of maturing and of respiration. In this latter connection some average figures quoted by Stiles are informative:—

	Millegrams of CO_2 given off at 0°C. per hour per kilo of fruit (respiration number).
Blackberries	30.9
Raspberries	20.4
Strawberries	17.8
Plums	6.5
Red Currants	5.0
Apples	4.6
Grapes	3.8
Oranges	1.8

It is seen that these values vary a good deal, the highest being for soft fruits, with the exception of red currants and grapes, the average values for stone fruit, the smaller values for apples and pears, and the smallest for citrus fruits. Stiles points out that, generally speaking, the higher the respiration number the quicker the ripening process, and the shorter the time the fruit can be kept.

Exactly why these differences occur, and what controls them is not yet clear, but have we not hints in the shape of chemical reactions and catalysts, and does not that conception open up the vision of a possible human control through the medium of artificial catalysts?

That this is not an altogether too optimistic viewpoint is evidenced by some recent American work carried out by Denny, who has found that the presence in storage chambers of very small amounts of ethylene gas has a marked effect on the respiration of lemons. Four different atmospheres were used, containing respectively 1 part of ethylene in 1,000, in 10,000, in 100,000, and in 1,000,000.

It was found that all these increased the respiration, the effect being greatest at the intermediate concentrations, that the increase in carbon dioxide output ranged from about 100 per cent. to 250 per cent., and that the treated fruit yellowed in about three or four days as compared with a period of one or two months taken by the untreated fruit.

The control of the maturing of fruit by artificial means is, of course, very much a thing of the future, and in the meantime much practical work has still to be done—work such as determining the most economic storage life of different fruits grown under different cultural conditions, the characteristics of different species, the best time of picking from the point of view of ripeness, the best treatment after picking, the necessity or otherwise of pre-cooling, and many other points of commercial importance.

In regard to such problems as these, it is encouraging to know that Governments as well as private individuals are carrying out original work. At the same time I submit for your consideration that this country needs to carry out more fundamental research as well. Such work is slow, and perhaps is expensive, but is sorely needed. As regards the cold storage of fruit, little has been done, the prospects are good, and at the selling-end the advantages to be won are great. We cannot expect other countries to do the work for us. For one thing, they have not the same inducement; they are in competition with us.

Nor is it reasonable to let one small section in Australia carry the burden for the rest. The position calls for the co-ordinated efforts of all interested; it is an Australian question. Its solution is one of the things that naturally belongs to the work of the Institute of Science and Industry, and would very probably be a matter for the support of the Commonwealth Government. To secure success in the world's markets, demands that we shall attack these questions, and in their solution our economic well-being lies.

ERADICATION OF NUT GRASS.

N. A. R. POLLOCK, Northern Instructor in Agriculture.

NUT GRASS (*Cyperus rotundus*), Nat. Order Cyperaceæ: One of a family of plants popularly known as Sedges.

Bailey, in his "Queensland Flora," describes some sixty-five species of Cyperus, several of which present a somewhat similar appearance, when growing, to nut grass, but fortunately are not pests like that species.

In the early stages of growth the appearance of several species is much alike, but later, when the flowering stems and flowers appear, the resemblance to a large extent ceases. Nut grass stems are rather slender, rising to a foot or a little higher, the upper portion of which is three-sided, the flowers being of a rich brown colour, the spikelets of which are borne in clusters on the stems. The species can always be distinguished by the nuts, which are bitter flavoured and borne on slender underground stems like widely separated beads on a string. Another species, *Cyperus esculentus*, or "Chufas," produces nuts somewhat similar to nut grass, but these are borne on single stems massed round the base of the plant and are sweet to taste, while the species is not a pest like nut grass but possesses economic value.

Nut grass is popularly supposed to reproduce from seed, but no authentic instance is recorded of plants being raised from seeds, which in many trials have been found infertile. Reproduction is effected from nuts and probably portions of the underground stem, which are distributed by the cultivating implements, the cloven hoofs of animals, or other mechanical agencies. It occurs widely in most tropical and sub-tropical climates over the globe and is more particularly plentiful on alluvial soils. Usually on virgin soils the nuts occur to within a few inches of the surface, but on cultivated lands will be found to the depth of the cultivated soil or as deep as the hole from which a stump has been taken and then filled in with soil. Nuts planted at a depth of some feet can be calculated to grow to reach the surface, so that no ploughing under can be considered as a means of extermination.

Nut grass is a decided menace to successful cultivation, since its growth is so rapid from the food supplies stored in the nuts as to smother out most crops, especially those of a low growth. Many strong-growing crops of more or less tall growth, such as sugar-cane, maize, sorghums, &c., are successfully grown in infested land, more especially in the cooler parts of the year, but their success is largely dependent on extra cultivation, which, in a wet season, cannot be effected as often as would be desirable.

The eradication of nut grass, economically, over an extended area is a problem which has not yet been solved and which does not appear possible of solution.

There are several means of eradication, but so far all are costly, or insist on a portion of the land whilst under treatment remaining unproductive or largely so over a term of years. Nut grass will thrive in dense shade and may be eventually smothered out by a dense-growing crop over two or more years. It may also be killed out by poisoning, fermentation, or burning, processes which are only applicable to small patches on account of cost, but which, from the fact that from these patches a whole field would become infected, must be treated or fenced off to allow of the larger area being worked profitably. The following systems have been tried with success on small areas:—

Salt.

Apply the cheapest salt obtainable at the rate of 1 lb. to the square foot as a top dressing and allow it to remain undisturbed until all has been dissolved by rain and carried into the soil—repeat if any fresh shoot occurs. The effect of this treatment is that the land will be poisoned for other crops by the salt and the land will be of no value for some years until the major portion of the salt has been leached out.

Arsenic.

The same remarks apply as to the effect of salt on the soil except that arsenic will be much more difficult to get rid of. Continued sprayings of the nut grass with a solution of arsenic or other weed killer would be prohibitive on account of the time necessarily taken up while the eradication of the arsenic from the soil would still have to be taken into consideration.

Molasses.

At the Agricultural Conference, at Gatton College in 1899, Mr. W. Gibson, of Bundaberg, is credited with the statement that he eradicated a patch of nut grass by pouring a few casks of molasses over it. Where molasses is obtainable very cheaply, as in the case near a sugar-mill, its use in the eradication of nut grass is well worthy of trial. It is suggested, in applying molasses with this object in view, that the ground containing the nut grass be broken up for 6 in. or so in depth and molasses mixed with water in equal quantities, or two of water to one of molasses poured on until the soil is saturated. The fermentation of the water and molasses will be great and the destruction of the nuts might be expected.

Stable Manure.

A patch of nut grass was eradicated at the Acclimitisation Society's Gardens, Brisbane, years ago by placing a thick heap of fresh manure over it. The fermentation and heat engendered together with the total exclusion of light could be calculated to eradicate the pest, but some long time would necessarily be taken and the incident is merely related as one of passing interest.

Pigs and Poultry.

Any means whereby the foilage of nut grass can be entirely prevented must in time cause the death of all nuts and roots. Thus, if poultry are kept enclosed in sufficient numbers to eat off every green shoot as it appears, or if pigs are styed or the soil is so trampled that no green growth is possible, the same result would be achieved as if a floor or other light-obscuring structure was built over it.

Paper Mulch.

It is possible much assistance towards eradication may be possible by the use of paper mulch in growing certain crops, which system has been much extolled in the recent few years. This paper is bought in rolls, which are laid on the ground and pegged or weighted down, the plants to be grown being planted by making a small hole in the paper. The success of the system with pineapples has been demonstrated, but it remains to be seen if the same measure of success will be achieved with other plants, since the pineapple plant is partly epiphytical. The exclusion of light and prevention of growth of the nut grass by means of the paper mulch should have some effect, and might be tried by farmers on infested patches with tomatoes or crops grown similarly.

Fire.

At the State Farm, Home Hill, during clearing operations some time ago, a patch of nut grass some 20 ft. across was discovered, which was eradicated in the following manner:—The land had been ploughed before the nut grass had been observed. The soil of the infested part was dug up and turned over with shovels, and logs, branches, &c., from the clearing nearby hauled on to the patch, making a good pile. This was then fired and resulted in the destruction of all nut grass on the burnt portion. It will be necessary where this is attempted to see that there is a certain amount of moisture in the soil, as it is considered the generation of steam assists in killing the nuts and roots.

Insects.

Some species of a Coccid insect are parasitical on nut grass. One, *Antonina australis*, has been spoken of as successful in New South Wales, and it has been observed in operation at Home Hill. The *Antonina* is closely allied to the Cochineal insect, but performs its work below the ground on the nuts, on which it appears as a white dusty part, exuding a blood-coloured liquid on being pricked with a pin. The effect of the insect is to destroy the nuts and subsequently the plant, which, when attacked, shows a yellowing and unhealthy appearance of the leaves, which afterwards die off. To eradicate nut grass by infestation with this parasite, it must be left two or three, if not more, years undisturbed, and the patch must be thickly infested with nut grass in order that the insects can easily travel from nut to nut. The foregoing treatments are only applicable to small areas, since the cost would be prohibitive over any large area, wholly or partly infested. On such an area the only feasible method is to endeavour to smother the nut grass out by dense, quick-growing crops, occupying the ground for long periods or planted in quick succession.

Smother Crops.

Kikuyu Grass.—Pennisetum clandestinum is considered to be the best grass to give success in this direction, but it must not be grazed or cut, and it must be allowed to occupy the ground at least three years.

Buffalo Grass.—*Stenotaphrum americanum* should also be successful. This grass frequently used for lawns, must not be confused with Buffalo Couch, a name frequently given to Carpet grass, *Paspalum platycaule*, which latter is not recommended.

Beans.—The Lima Bean and also the Lab Lab, when grown without support, will cover the ground with a dense mass of vine and will last practically two years, smothering out any growth that does not grow higher than nut grass. A certain amount of profit might be derived from this crop by hand-picking the pods for use green, or in the case of the Lima or Haricot beans when ripe.

Velvet Beans.—Beans of this family form a dense growth and are valuable for hay or green forage. According to the variety they could be expected to cover the ground from five to eight months, when they should be ploughed under or harvested and another smother crop planted immediately.

Sorghum.—Saccharine or other tall-growing varieties of sorghum sown broadcast rather thickly, using 30 to 40 lb. of seed to the acre, would form a dense growth and prevent any other growth while occupying the ground. In the North this crop could be expected to last uncut for two years.

Field Peas or Vetches.—These would be grown only in the winter months, when the nut grass does not make very much growth and would, with cereals such as wheat, barley, &c., be crops to grow between the crops previously mentioned, which succeed better in the warmer months.

When smothering out nut grass by growing crops, it is important that the crops be continuous, so that the nut grass has as little breathing space as possible.

ENTOMOLOGICAL CONTROL.

Mr. Edmund Jarvis, Entomologist, Bureau of Sugar Experiment Stations, Meringa, North Queensland, supplies the following additional information on the subject:—Whilst Acting State Entomologist for Queensland during 1913, I was asked to investigate certain methods of using a parasite (*Antonina australis* Green) for destroying nut grass at Bundaberg, where it was said to be doing excellent control work.

The following notes are from my report, published in December, 1913:—

The introduction of this insect has evidently been attended with highly beneficial results, affording valuable evidence of its usefulness.

Mr. F. L. Nott states that, about three years ago, he obtained a small bag full of infested grass roots from Mr. E. Lane, who had told him of the insect's habits.

He planted pieces of these roots among his nut grass in a row, alongside a fence, at intervals of about 20 ft. apart, and finding upon examination a few months later that the parasites were spreading rapidly, was encouraged to infect other patches.

He started these experiments on 1½ acres, and at the present time has no continuous areas under this weed, and had practically destroyed all the nut grass on 20 acres of land. His soil is red volcanic, of a heavy nature.

Mr. Nott volunteered the following information, the truth of which was confirmed by my own observation:—

(1) That he has never found these coccids on roots of sugar-cane, or fodder grasses, although often using the former as a smother crop.

(2) That the parasites thrive best on land that is fairly open and allowed to remain undisturbed; but in consolidated soils or roadways, &c., spread with difficulty.

The plan of procedure adopted and found successful is as follows:—

Pieces of infested nut grass are planted in rows across the area to be treated, from 40 to 50 ft. apart and 20 ft. from plant to plant, each piece being placed about 3 in. below the surface against a flourishing clump of the weed. Operations are then suspended for a few months to allow the coccids to become established and extend a few feet from the infected centres, after which the ground is ploughed, harrowed, and planted with a cover crop of lucerne, sugar-cane, or pasture.

No cultivation is permitted until at least twelve months after the death of the green tops, as the parasites are still at work destroying the lower roots, and should be allowed time to reach and kill every nut.

Cultivating amongst the newly-established colonies is, I think, a drawback to the above method, but while doubtless killing a larger percentage of the insects, would, at the same time, ensure their even distribution to all parts of the field, thereby saving the hand labour entailed by closer planting.

(1) Why have several previous attempts to utilise this parasite for destroying nut grass proved unsatisfactory elsewhere?

(*a*) The land may have been disturbed too soon after treatment, thus causing exposure and death of the majority of coccids.

(*b*) Possibly soil conditions were unfavourable in some instances; the parasites are most likely unable to penetrate deeply in heavy, compact clays, or stiff wet soils, and in such cases the lower nuts might remain uninjured.

(*c*) Neglecting to plant a cover crop, or introducing the parasites during an unfavourable season, or when in a dying condition, brought about, perhaps, by prolonged exposure or damage during transit, would also tend to result in failure.

(2) Will these coccids, after exhausting the supply of nut grass, attack other plants?

(*d*) This is a matter for further research, but evidence, so far, seems to favour the supposition that their range of dietary is very limited. I examined the roots of sugar-cane and a few grasses, including "Buffalo Couch," growing among a mat consisting of dead nut grass leaves, which had been killed by this parasite, but found them unaffected.

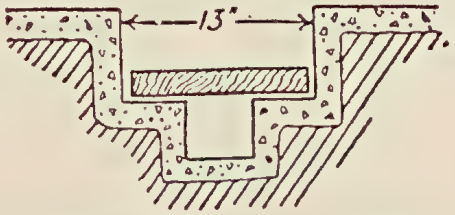
(*e*) In 1904, Mr. W. W. Froggatt published the following information on this heading:—"Of course, there is always the danger that a root-infesting coccid may change its habits and attack other than its natural food-plant, and this was pointed out to our correspondents anxious to try experiments. To me this danger appears to be slight in this instance, as after two years the nut grass *Antonina* has not been found upon any other roots; and, secondly, that none of our grass or root crops are allied to or like the underground rhizomes of this obnoxious sedge. Again, among the described species of this genus, all of them seem to attack only one kind of food-plant."

(*f*) Many insects are very exclusive in matters of the diet, will sooner perish than eat unpalatable food. Some of the cochineal insects, for example, which are closely related to the parasite under consideration, are confined to a single species of prickly-pear, and cannot be induced to subsist on other species of genus *Opuntia*.

I see no reason why the services of this insect should not be successfully utilised for the purpose of destroying nut grass in Queensland, in districts where soil conditions are favourable to its spread; and provided that Mr. Nott's method of treatment be adopted, it seems reasonable to assume that the results achieved at Bundaberg should be obtainable elsewhere.

COWSHED GUTTER.

The illustration, which appeared in the Canadian "Grain Growers' Guide," is the idea of a farmer at Medicine Hat to keep the floor of the cowshed clean. By providing a double channel, as shown, the urine is allowed to pass down under the board which divides the gutter, and always flows freely. This has the added



advantage that one can clear up the solid dung much more easily than the slush which forms in the single channel. The construction of the gutter is obvious from the sketch, and would present no difficulties in practice. It would be well to tar the planks thoroughly to prevent rotting and to facilitate cleaning, and run the channels out to a good liquid manure tank.

THE COMMONWEALTH SUGAR POLICY.

EXTENSION OF EMBARGO.

An extension of the period of the embargo on the importation of sugar into Australia for three years from 31st August next has been decided upon by the Federal Ministry. This assistance will be given to the sugar industry, subject to compliance with certain conditions regarding the price of sugar to the consumer and other matters.

The conditions with which the sugar industry has to undertake to comply are that sugar shall be made available at prices that will give the following results in the main distributing centres of each State:—

Refined Sugar.

(1) Retail price, 4½d. per lb.; per ton, £42. (2) Retailers' and housewives' price for not less than ½-ton lots for net cash, per lb., 4d.; per ton, £37 6s. 8d. (3) Net wholesale and manufacturing price for products other than fruit for home consumption for net cash, per lb, —; per ton, £36 11s. 9d. (4) Manufacturing price for processing fruit products for home consumption for net cash, per lb., 3¼d.; per ton, £30 6s. 8d.

The first provision is the same as at present. No. 2 shows a reduction of 4s. 8d. a ton on the present price. No. 3 shows a decrease of 8s. 3d. a ton for manufacturers of beer, biscuit, cakes, confectionery, cordials, condiments, jelly crystals, tanners, druggists, &c. No. 4 is a new advantage of £5 6s. 4d., in addition to the special concession of £1 7s. already given, the total thus being £6 13s. 4d.

Mill White Sugar (Equal to Java Whites).

(1) Retail price, per lb., 4d.; per ton, £37 6s. 8d. (2) Retailers' and housewives' price for not less than ½-ton lots for net cash for definite orders at reasonable notice, about per lb., 3½d.; per ton, £33 3s. 9d. (3) Wholesale and manufacturing price orders at reasonable notice for net for home consumption for definite cash, per lb., —; per ton, £32 10s. 6d.

All the conditions regarding mill white sugar constitute a new advantage.

Stock Rebate.

Manufacturers of fruit products to be granted a rebate on the sugar contents of their stocks held when the price of sugar is reduced to them to £30 6s. 8d., provided satisfactory proof is given that the selling prices have been correspondingly reduced. This, it is explained, will enable full quantities of fruit to be processed this season, and the rebate will be passed on to the public.

Export Price.

Sugar for all exported manufactures to be supplied at the Australian-in-bond equivalent of the world's parity calculated and determined in Melbourne by an export sugar committee, composed of one representative each of the Commonwealth Government, of sugar industry, and of manufacturing exporters. The export price will thus vary as world's parity moves up or down.

Uniform Australian Prices.

All sugar to be supplied at the same price in the main distributing centres in each State (means Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, and Launceston). This is the same principle as at present, but Perth has been substituted for Fremantle.

Export Losses.

The sugar industry to be responsible for any loss arising from surplus sugar exports.

Stability the Aim.

In the course of his announcement of the Federal policy the Prime Minister (Rt. Hon. S. M. Bruce, M.C.) said that the interests of consumers, both domestic and manufacturing, as well as the interests of growers, have been amply safeguarded. The price which will be received by the grower and the amount which will

be paid by the consumer will be equivalent to that which would exist if the world's parity for sugar were reasonably stable, and a tariff imposed sufficient for the proper protection of the industry. The Government is of opinion that under Australian conditions of production there is no possibility of the retail price for small parcels of the best refined sugar being less than 4½d. a lb. in the main distributing centres. This price is neither artificially high nor unreasonable, representing, as it does, a percentage advance on the 1914 prices, approximately equivalent to the increases in all other food products.

The question of over-production in the sugar industry is met by the provision that the sugar industry must be responsible for any loss arising from the surplus sugar production. This will have a very stabilising effect upon the industry, and should go far to remove one of the greatest dangers with which it is confronted. In this connection it must also be remembered that the preferential trade arrangements with the United States should provide ever-widening markets for sugar products, and enable the industry to expand without undue risk of loss through surplus exports.

The National Aspect.

In conclusion, said Mr. Bruce, the circumstances of this industry were considered (as in fairness they only could be) from a national rather than an individual standpoint. It must be conceded that under the Government's proposal, consideration has been given, not only to the industry itself, but to the manufacturers, the fruitgrowers, the distributors, and the consumers. Sugar, whilst grown in New South Wales and Victoria, was, and would remain for some time our greatest Northern industry. On the other hand, fruitgrowing and manufacturing incidental thereto constituted the most important Southern industries. Over and above these were the individual consumers of sugar throughout Australia.

The Government, with a full knowledge of the just claims of every section, had tried honestly to reconcile them, and had put forward its new sugar policy as the only reasonable basis upon which all their interests and the larger interests of Australia could be fairly safeguarded.

The Queensland Point of View.

Commenting on the Prime Minister's announcement in the course of a Press interview, the Premier (Hon. E. G. Theodore) said:—

"I have heard with considerable satisfaction of the Federal Government's decision to continue the embargo for another three years. The Commonwealth Government must realise, as we do in Queensland, that the industry is faced with a rather critical situation for next year, inasmuch as it will have to provide for the export of anything up to 150,000 tons of excess sugar. The loss of the export of this excess sugar production is very considerable. The necessity of meeting that loss, together with the further concession to be made to the Australian manufacturers who use sugar for primary products, will reduce the price of raw sugar to the Queensland manufacturers.

"This year Queensland millers received £26 a ton f.o.b., at their nearest port. Next year the price must be less than that to make good the loss on the exportable surplus and the concession to manufacturers.

"However, with smaller excess production in succeeding years, the industry may get the full benefit of the £27 during the last two years of the currency of the embargo. I say emphatically that the embargo, even with the additional conditions, is infinitely preferable to a Customs duty."

TO CORRESPONDENTS.

Correspondents seeking information through the Journal are requested to address inquiries to the Under Secretary, Department of Agriculture and Stock, Brisbane. When the importance or urgency of the subject warrants it, replies will be sent by post without unnecessary delay; and, if of general interest, will be later published in the Journal. Name and full address should be supplied with each inquiry, not necessarily, however, for publication.

EGG-LAYING COMPETITIONS.

N.U.P.B.A., ZILLMERE.

The advent of the hot weather is reflected in the scores for November, the eighth month of the current competition. In the Black Orpington section, broodiness has been prevalent, but even the light breeds have slackened considerably. The averages per bird were White Leghorns 17.0, Black Orpingtons 16.1, and other varieties 15.8, while the whole competition averaged 16.6.

Three deaths occurred, all White Leghorns, No. 17 owned by Mr. J. T. Webster, No. 44 P. F. Adams, and No. 81 Mr. J. Purnell.

WHITE LEGHORNS.

Pen No.	Owner.	Nov.	Total.
104	Oakleigh P.F.	26	208
21	Hodge, A.	23	184
20	Hodge, A.	25	181
97	Sommerlad, K. A.	21	179
82	Wakefield, W.	24	178
84	Wakefield, W.	24	177
55	Hutton, J.	20	BE174
70	Wilson, J. R.	18	BE174
12	Berry, W. J.	24	173
105	Oakleigh P.F.	17	173
95	Williams, G.	23	171
66	Tracey, E.	23	BE171
88	Duff, R.	25	170
85	Enroh Pens	16	BE169
30	Campbell, M. H.	21	B169
89	Duff, R.	21	167
19	Hodge, A.	20	166
102	Walters, A. S.	24	E166
6	Pember, H. T.	18	163
31	Hindes, W. and G. W.	17	BE163
90	Duff, R.	21	162
79	Purnell, J. E. G.	20	161
35	Chapman, J. L.	21	B161
67	Kidd Bros.	18	B161
11	Berry, W. J.	26	158
16	Webster, J. T.	21	158
71	Wilson, J. R.	12	B158
101	Walters, A. S.	23	157
54	Rogers, G. E.	19	E157
18	Webster, J. T.	21	BE156
52	Rogers, G. E.	20	B155
73	Raymond, E. C.	23	154
14	Marks, G.	24	B154
28	Campbell, M. H.	22	B154
53	Rogers, G. E.	20	E153
41	Cole, R. C.	22	153
68	Kidd Bros.	23	153
29	Campbell, M. H.	20	B152
25	Britten, H. T.	19	151
92	Hodgson, C. A.	20	151
27	Britten, H. T.	17	E150
48	Turner, R. C. J.	17	149
65	Tracey, E.	23	148
174	Grenier, S. L.	20	148
42	Cole, R. C.	20	B148
75	Raymond, E. C.	14	B148
58	Staib, A.	24	147
78	Newberry, M. F.	0	147
32	Hindes, W. and G. W.	17	BE147
1	Williams, F. J.	22	146
13	Marks, G.	23	146
37	Fraser, H.	25	BE146
51	Earl, J.	22	145
106	Howard, W. L.	23	145
36	Chapman, J. L.	23	E145
56	Hutton, J.	21	144
80	Purnell, J. E. G.	21	144
61	Carinya P.F.	15	142
39	Fraser, H.	17	141
64	Tracey, E.	10	141
15	Marks, G.	17	139
74	Raymond, E. C.	21	139
9	Struman, H.	21	BE139
76	Newberry, M. F.	0	138
100	Walters, A. S.	7	138
99	Sommerlad, K. A.	17	137
8	Struman, H.	22	E137
108	Howard, W. L.	21	135
87	Enroh Pens	21	134
40	Cole, R. C.	13	133
49	Earl, J.	4	B132
10	Berry, W. J.	21	131
38	Fraser, H.	12	131
60	Staib, A.	11	130
2	Williams, F. J.	16	E129
3	Williams, F. J.	20	E129
22	Neil, A.	17	BE127
103	Oakleigh P.F.	4	126
47	Turner, R. C. J.	22	125
46	Turner, R. C. J.	0	124
23	Neil, A.	14	BE124
86	Enroh Pens	20	123
57	Hutton, J.	1	BE123
45	Adams, P. F.	10	122
98	Somerlad, K. A.	10	121
33	Hindes, W. and G. W.	23	B121
72	Wilson, J. R.	20	B121
5	Pember, H. T.	24	120
69	Kidd Bros.	22	120
4	Pember, H. T.	16	E117
96	Williams, G.	7	BE117
93	Hodgson, C. A.	3	116
34	Chapman, J. L.	23	115
62	Carinya P.F.	18	115
172	Grenier, S. L.	21	113
26	Britten, H. T.	20	112
91	Hodgson, C. A.	22	111
59	Staib, A. (Replaced 13-6-24)	14	110
83	Wakefield, W.	16	103
63	Carinya P.F.	3	100
77	Newberry, M. F.	0	B97
107	Howard, W. L.	3	90
24	Neil, A.	2	B86
173	Grenier, S. L.	11	B80
7	Sturman, H.	9	B58
50	Earl, J.	17	38

B Signifies bird under standard weight.
E Signifies egg under standard weight.

BLACK ORPINGTONS.

Pen No.	Owner.	Nov.	Total.
147	Everlay P.Y.	28	E194
142	Cummings, F. P. ..	26	E193
127	Walters, E.	15	192
156	Hutton, J.	16	189
114	Wilson, W. R. ..	9	E186
126	Brotherton, T. H. ..	15	185
130	Rogers, G. E. ..	17	183
154	Hutton, J.	17	E179
144	Cummings, F. P. ..	24	179
111	Fanning, T.	22	178
110	Fanning, T.	18	177
150	Raymond, E. C. ..	26	175
129	Walters, E.	15	171
131	Rogers, G. E. ..	19	171
143	Cummings, F. P. ..	20	171
138	Adams, W. S. ..	9	BE170
113	Wilson, W. R. ..	18	169
155	Hutton, J.	20	168
123	Potter, J.	23	E166
139	Pryde, J.	15	163
116	Campbell, G. L. ..	13	161
133	Dennis, C. C. ..	11	157
140	Pryde, J.	23	E156
119	Chaille, H. M. ..	26	B153
153	Enroh Pens	21	152
120	Chaille, H. M. ..	16	150
149	Raymond, E. C. ..	23	150
125	Brotherton, T. H. ..	17	145
136	Adams, W. S. ..	16	E144
115	Campbell, G. L. ..	0	E143
146	Everlay P.Y.	22	142
117	Campbell, G. L. ..	0	BE140
145	Everlay P.Y.	12	137
134	Dennis, C. C.	21	135
128	Walters, E.	14	134
132	Rogers, G. E. ..	15	134
148	Raymond, E. C. ..	15	132
112	Wilson, W. R. ..	16	131
152	Enroh Pens	21	131
109	Fanning, T.	0	E130
122	Potter, J.	15	E128
137	Adams, W. S. ..	16	121
151	Enroh Pens	3	E112
135	Dennis, C. C.	11	E105
121	Potter, J.	13	85
141	Pryde, J. (Replaced 7-7-24)	6	81
118	Chaille, H. M. ..	7	80
124	Brotherton, T. H. (Replaced 30-8-24) ..	26	75

OTHER VARIETIES.

Pen No.	Owner.	Nov.	Total.
159	Messines Poultry F. (R.I.R.)	24	162
175	Everlay P.Y. (B.L.)	23	E156
161	Ollier, T. C. (B.R.) ..	24	147
169	Pryde, J. (Lang.) ..	14	145
168	Forsyth, W. H. (S.W.)	17	135
165	Walters, A. S. (B.R.)	21	131
157	Messines Poultry F. (R.I.R.)	22	130
167	Forsyth, W. H. (S.W.)	16	130
180	Ferguson and Sons, J. (B.L.)	15	129
160	Ollier, T. C. (B.R.) ..	5	126
162	Ollier, T. C. (B.R.) ..	16	E125
158	Messines Poultry F. (R.I.R.)	13	121
166	Forsyth, W. H. (S.W.)	9	114
178	Ferguson and Son, J. (B.L.)	13	110
170	Pryde, J. (Lang.) (Replaced 23-6-24)	21	B110
164	Walters, A. S. (B.R.)	12	97
177	Everlay P.Y. (B.L.)	17	E96
179	Ferguson and Son, J. (B.L.)	18	E96
176	Everlay P.Y. (B.L.)	20	95
171	Pryde, J. (Lang.) (Replaced 21-6-24)	0	91
163	Walters, A. S. (B.R.) (Replaced 3-7-24)	12	80

B Signifies bird under standard weight.
E Signifies egg under standard weight.

C. KIDD, Hon. Secretary.

N.U.P.B.A. TOOWOOMBA SUB-BRANCH.

Single Test Egg-Laying Competition—Scores to 30th Nov., 1924.

BLACK ORPINGTONS.

Pen No.	Owner.	Nov.	Total.
41	Wilson, W. R. ..	27	186
51	*Holmes, R.	21	185
42	Wilson, W. R. ..	25	182
24	*Carr, T. J.	23	180
45	Stephens, H. B. ..	20	179
9	Everlay P. Farm ..	15	176
23	Carr, T. J.	21	173
29	*Adams, W. S. ..	21	172
40	Rogers, G. E. ..	23	169
52	Holmes, R.	11	169
15	Macfarlane, K. ..	25	167
20	Maund, Mrs. L. ..	18	167
28	Williams, W. D. ..	11	164
2	Hutton, Jas.	4	162

*Signifies bird laying under-weight eggs.

BLACK ORPINGTONS—*continued.*

Pen No.	Owner.	Nov.	Total.
10	Everlay P. Farm ..	16	161
39	Rogers, G. E. ..	22	161
50	Ollier, T. C.	19	159
5	Walters, E.	6	159
32	Radford, G.	21	159
25	Stephens, Moss ..	20	157
7	*Adams, P. F.	5	156
30	Adams, W. S. ..	21	155
19	Maund, Mrs. L. ..	20	154
22	*Walsh, H.	12	154
36	Rivett, R. R.	25	151
43	Smith, E. R.	17	150
6	Walters, E.	21	149
48	Head, J.	26	148
49	*Ollier, T. C.	15	147
16	*Macfarlane, K. ..	25	143
13	Burns, R.	11	139
27	Williams, W. D. ..	17	138
3	McLay, J. A.	14	137
33	Potter, Jas.	6	137
1	Hutton, Jas.	15	132
44	Smith, E. R.	17	129
14	Burns, R.	21	127
21	Walsh, H.	13	127
11	Webb, A. W.	0	122
47	*Head, J.	20	118
37	Short, J. W.	2	117
8	Adams, P. F. ..	16	115
34	*Potter, Jas.	17	114
38	Short, J. W.	18	111
26	Stephens, Moss ..	21	109
4	McLay, J. A. ..	16	106
18	Champion, S. H. K. ..	16	97
31	*Radford, G.	0	94
35	Rivett, R. R.	4	71
17	*Champion, S. H. K.	0	41
12	Webb, A. W.	0	16
46	Stephens, H. B. (Replaced Bird) ..	0	1

OTHER VARIETIES.

70	*Dibbs, H. (Lang.) ..	29	202
60	Le Pla, A. W. (R.I.R.)	22	192
53	Warrian, C. G. (Rock.)	27	190
66	*Becker, W. (Lang.) ..	18	173
57	*Maund, Mrs. L. (Col. W'dotte)	14	162
59	Le Pla, A. W. (R.I.R.)	22	155
65	*Becker, W. (Lang.) ..	14	154
68	*Everlay P.F. (B.L.)	22	145
61	Harrington, J. (B.L.)	14	142
56	*Carr, T. J. (S.W.) ..	18	139
64	Rafter, J. J. (B.L.) ..	16	130
71	Brand, V. (R.I.R.) ..	18	129
54	Warrian, C. G. (Rock.)	15	124
69	Dibbs, H. (Lang.) ..	7	113
72	Brand, V. (R.I.R.) ..	17	98
63	Rafter, J. J. (B.L.) ..	10	90
67	Everlay P.F. (B.L.)	22	89
55	Carr, T. J. (S.W.) ..	12	88
58	Maund, Mrs. L. (C.W.)	12	85
62	*Harrington, J. (B.L.)	0	42

WHITE LEGHORNS.

132	*Short, J. W.	27	208
112	*Chapman, S.	27	196
114	Cole, R. C.	20	187
131	*Short, J. W.	21	187
73	Dippel, D. H. ..	27	184
105	Hutton, Jas.	20	183
124	King, J. E.	24	181
121	Grant, W.	26	180
110	*Enroh Pens	23	178
91	Stilton, G.	24	176
122	Grant, W.	25	176
123	King, J. E.	27	175
118	Goggins, J.	26	173
111	Chapman, S.	19	170
113	Cole, R. C.	23	167
106	*Hutton, Jas.	19	166
129	Manning, H. G. ..	21	166
115	Taylor, Jas.	24	164
88	*Warrian, C. G. ..	16	159
74	Dippel, D. H. ..	9	158
100	*Newton, J.	21	158
85	Rivett, R. R.	23	157
109	*Enroh Pens	22	157
78	Howard, R. B. ..	19	155
93	Williams, D. W. ..	14	155
125	*Maurer, G.	18	155
96	Adams, W. S. ..	23	154
101	Turner, R. C. J. ..	21	154
86	Rivett, R. R.	24	153
95	Adams, W. S. ..	22	152
75	Wilson, W.	21	151
117	Goggins, J.	20	150
130	*Manning, H. G. ..	27	149
87	Warrian, C. G. ..	20	148
116	Taylor, Jas.	19	147
128	Stilton, E. J.	22	146
77	Howard, R. B. ..	20	145
108	Adams, P. F. ..	18	145
99	*Newton, J. W. ..	16	143
103	*Fallon, P. J.	15	143
120	Rogers, G. E. ..	24	143
76	Wilson, W.	21	142
97	Hunt, G.	14	142
81	Smith, E. R.	20	139
80	McBean, S.	21	138
107	Adams, P. F.	21	138
126	Maurer, G.	23	138
79	*McBean, S.	23	137
90	Ellis, L. E.	21	136
104	*Fallon, P. J.	20	136
102	Turner, R. C. J. ..	20	133
92	Stilton, G.	19	129
83	Carinya P. Farm ..	11	126
127	Stilton, E. J.	16	126
119	Rogers, G. E. ..	22	125
84	Carinya P. Farm ..	13	122
89	Ellis, L. E.	17	120
94	Williams, W. D. ..	12	113
98	Hunt, G.	21	106
82	Smith, E. R.	21	103

* Signifies bird laying under-weight eggs.

J. GARNER, Government Supervisor.

MOUNT GRAVATT.

In the course of November, 5,319 eggs were laid, an average of 19.7 per bird. Many were affected by broodiness. Mr. Hutton's "B" bird broke her sequence after completing the century. One death occurred. "U" opposite the score indicates that the eggs are under the standard of 24 oz. to the dozen.

SECTION 1.

LIGHT BREEDS.

Name.	Breed.	A.	B.	C.	D.	E.	F.	Total for Month.	Grand Total.
W. and G. W. Hindes	White Leghorns ..	168	186	181	192	187	164	151	1078U
W. H. Flowers ..	Do. ..	135	135	164	178	180	181	129	970U
S. Grenier	Do. ..	147	151	178	160	149	165	142	963
T. H. Craig ..	Do. ..	153	164	161	175	121	178	148	952
R. C. Turner ..	Do. ..	168	173	146	163	122	179	142	951
G. Marks	Do. ..	196	152	159	140	151	152	158	950
Mrs. L. Anderson ..	Do. ..	163	155	165	160	150	156	140	949U
H. Fraser	Do. ..	181	146	152	173	139	157	118	948
G. W. Cox	Do. ..	161	136	175	125	182	157	144	936
H. T. Britten ..	Do. ..	181	176	113	150	88	146	139	932U
W. Wakefield ..	Do. ..	96	167	167	150	168	181	150	929
Oakleigh P. Farm ..	Do. ..	123	176	142	147	170	170	112	928
T. W. Honeywill ..	Do. ..	154	178	45	153	161	133	136	924
J. E. G. Parnell ..	Do. ..	150	142	135	161	165	167	124	910
John L. McLachlin	Do. ..	67	157	180	142	161	104	96	910
Kidd Bros.	Do. ..	165	163	122	165	142	151	120	908
L. Bird	Do. ..	154	162	155	88	173	164	132	896U
Mrs. R. E. Hodge ..	Do. ..	151	160	130	169	145	139	116	894
L. J. Silman ..	Do. ..	159	159	150	133	140	118	126	859
B. Driver	Do. ..	134	117	123	178	162	145	138	859
A. A. Sterling ..	Anconas	128	131	168	154	125	147	108	853U
A. Neil	White Leghorns ..	167	157	147	152	64	144	105	831U
W. D. Melrose ..	Do. ..	97	135	182	171	87	138	94	828U
W. D. McHardie ..	Anconas	144	128	117	139	143	139	124	810
H. P. Clarke ..	White Leghorns ..	133	119	137	155	138	128	119	810
J. W. Newton ..	Do. ..	150	134	122	117	139	144	131	806
T. W. Biddulph ..	Do. ..	175	159	91	146	99	111	94	781
George Williams ..	Do. ..	123	40	151	149	140	131	102	734
Chris. A. Goos ..	Do. ..	6	177	110	104	166	146	72	709U
Ancona Club, No. 2	Anconas	126	121	78	82	124	106	88	637
Ancona Club, No. 1	Do. ..	84	131	118	145	79	17	72	574

SECTION 2.

HEAVY BREEDS.

James Hutton ..	Black Orpingtons ..	181	210	183	148	150	171	131	1043
James Potter ..	Do. ..	160	176	158	133	182	140	118	949U
R. Burns	Do. ..	155	143	149	149	136	153	131	885
Mrs. A. E. Gallagher	Do. ..	133	170	138	146	152	140	139	879
E. Walters	Do. ..	98	126	126	189	194	129	96	867
Carinya Poultry Farm	Do. ..	127	117	5	144	152	161	82	863U
H. G. Stephens ..	Do. ..	150	154	139	127	138	127	133	835
Kidd Bros	Do. ..	144	132	137	148	154	114	106	829
W. and G. W. Hindes	Do. ..	133	91	149	124	176	119	75	792U
Mrs. A. Kent ..	Do. ..	151	180	85	116	107	138	122	777
F. W. Lenny ..	Do. ..	150	108	163	101	107	146	93	775U
J. Ferguson	Do. ..	64	118	135	137	137	152	110	743
H. M. Chaille ..	Do. ..	124	134	155	122	168	37	99	740U
E. C. Stead	Wyandottes ..	79	149	103	133	101	108	114	673U

W. D. DELL.

In the course of December 4,988 eggs were laid, being an average of 18·4 eggs per bird. The scores have been considerably affected by the seasonable trouble of broodiness which has not been confined to the heavy breed section. A few birds are also moulting. The general health of the birds is excellent. Two deaths occurred. The following are the individual scores, and U opposite the totals indicates that the eggs are under the standard weight of 24 oz. per dozen.

SECTION 1.

White Leghorns (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Monthly Total.	Grand Total.
D. and G. W. Hindes ..	187	213	207	220	210	186	145	1223U
S. Grenier	172	173	207	186	169	190	147	1110
T. H. Craig	179	192	188	199	142	201	149	1101
G. Marks	223	178	185	164	176	173	149	1099
W. H. Flowers	159	144	185	193	199	205	115	1085U
Mrs. L. Anderson ..	187	179	187	184	166	175	129	1078U
D. Wakefield	122	191	192	174	194	204	148	1077
H. Fraser..	203	160	175	193	162	181	126	1074
H. T. Britten	209	199	142	171	106	168	141	1073U
G. W. Cox	187	158	200	138	207	178	132	1068
R. C. J. Turner	188	193	157	187	134	201	104	1060
T. W. Honeywill ..	171	203	166	176	180	155	127	1051
L. Bird	176	184	180	105	197	193	139	1035U
Oakleigh Poultry Farm..	137	197	158	162	194	183	103	1031
J. E. G. Parnell	168	163	140	183	190	185	109	1029
Kidd Brothers	183	179	144	185	158	174	115	1023
Mrs. R. E. Hodge ..	169	180	150	191	165	159	120	1014
John J. McLachlan ..	82	158	206	164	187	113	99	1009
B. Driver	157	131	141	205	183	171	129	988
A. A. Stirling (Anconas)	141	137	192	177	146	168	108	961U
A. Neil	190	170	168	170	86	165	118	949U
L. J. Silman	165	181	153	155	154	136	85	944
H. P. Clarke	157	138	160	177	158	154	134	944
W. McHardie (Anconas)	168	147	134	156	164	159	118	928
J. W. Newton	160	157	141	133	155	171	111	917
W. D. Melrose	97	142	193	195	87	162	66	895U
T. W. Biddulph	201	182	97	161	103	122	85	866
Geo. Williams	123	40	178	176	164	155	102	836
Chris. A. Goos	6	203	112	105	189	170	76	785U
Ancona Club, Pen 2 ..	148	137	96	98	147	123	112	749
Ancona Club, Pen 1 ..	97	148	137	166	83	17	74	648

SECTION 2.

Black Orpingtons (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Monthly Total.	Grand Total.
James Hutton	206	237	207	165	174	190	136	1179
James Potter	175	200	178	151	206	158	119	1068U
Mrs. A. E. Gallagher ..	158	194	153	172	178	156	132	1011
R. Burns	155	171	167	171	155	175	109	994
Carinya P. Farm ..	128	134	23	162	165	186	92	955U
H. G. Stevens	177	164	152	144	164	138	104	939
Kidd Bros.	167	157	153	164	171	123	106	935
E. Walters	109	138	126	204	211	132	58	925
Mrs. A. Kent	172	204	86	136	121	152	94	871
J. Ferguson	78	131	138	167	156	174	101	844
D. and G. W. Hindes ..	143	92	168	129	189	119	48	840U
H. M. Chaille	147	148	173	126	188	37	79	819U
E. C. Stead (S.W.) ..	95	162	120	158	120	124	106	779U
F. W. Lenny	166	120	173	113	121	166	84	759U

W. D. DELL.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this section, unless otherwise stated, has been taken from "The International Review of the Science and Practice of Agriculture," published at Rome by the International Institute of Agriculture.

Sulphur in Relation to Soil Fertility.

POWERS, W. L. (Chief of Department of Soils, Oregon Experiment Station) Station Bulletin, No. 199, Oregon Agricultural College, Oregon, U.S.A., 1923.

In 1912, the Oregon Experiment Station found that the increase in yield of alfalfa (lucerne) obtained by the use of potassium sulphate was equal to that when acid phosphate was applied.

Tests showed that on more than twenty arid and semi-arid soil types of Oregon, the yield of 100,000 acres of alfalfa could be increased by one ton or more per acre with sulphur, at a cost of about one dollar per acre per annum. Legumes generally responded to sulphur applications, also wheat and potatoes, but there was little increase in the case of peas, beans, maize, kale, rape, and sunflowers. The protein content of crops was found to be increased. Lysimiter studies show that 40-45 lb. of sulphur is lost in the annual percolate.

Sulphur seems to be related to nitrogen supply. Water culture and pot experiments indicate that sulphur is an especially necessary element, although a small amount only is necessary.

Applications up to 1,000 lb. per acre have resulted in continued marked increase in yield. The use of sulphur beyond the amount needed to replace deficiency tends to increase soil acidity in humid and semi-humid regions, and its continued use will make liming more necessary. A combination of sulphur, rock phosphate, farm manure, and lime has given the maximum yields.

Lucerne as a Fire-break.

GREENWOOD, F. W., "New Zealand Journal of Agriculture," Vol. XXVIII.

The value of lucerne as a fire-break was strikingly demonstrated at Marlborough (New Zealand) quite recently. The wind carried a fire directly toward the Danthona grassland, but due to an intervening lucerne field it was possible to keep the fire under control. In drier districts where grass fires are liable to occur, the establishment of protection belts of lucerne is well worth consideration.

Loss of Weight in Animals during Transport.

DECHAMBRE, P., Pertes de poids des animaux pendant les transports. "Revue de Zootechnie, la Revue des éleveurs," Year 3, No. 5, pp. 337-340. Paris, 1924.

Animals that travel, whether on foot or by rail, suffer loss of weight to a greater or less degree owing principally to the decrease in the content of the digestive tube which gradually becomes empty.

The live-weight is the first to be affected at any rate in ordinary journeys of average length or short duration, little difference being noticeable in the net weight. If, however, the animals have to make a long or trying journey, the loss in net weight is very marked. The evacuation of the food and liquids which causes the fall in weight takes place chiefly on the first day, excretion being much diminished subsequently. An ox of 600kg.* will lose 30-40 kg. the first day and 5-7 kg. on subsequent days. This latter decrease is due to some extent to an interstitial reabsorption which takes place within the tissues, and it allows the fall in net weight to be estimated, for although at first this is little noticeable, it continues to increase with the length of the journey, especially if the animals are supplied with insufficient food and water.

In the course of the first 24 hours, the loss that occurs varies greatly according to the kind of animal, the breed to which it belongs, the distance travelled and the kind of transport. Cattle carried by rail lose on an average 25 to 50 kg. in weight according to their size, but this average may be greatly exceeded.

A lot of cattle weighed at a fair were found to have lost in the course of their transport to the abattoir 9.7 per cent. of their weight, whereas another lot that had

* Note.—A kg. (kilogramme) = 2.2 lb.

been driven in straight from the pasture showed a loss of 13.1 per cent. These losses affect the net meat yield the percentage of which is higher the greater the reduction of the animal.

A sheep weighing 40 to 50 kg. may lose 3 to 4 kg., and a calf of 150 kg. loses about 4 kg., the first day and 2 kg. the second. A pig of 100-110 kg. loses 5 to 6 kg. The loss of flesh is frequently nil, unless the distance is very long, the pigs extremely fat and the journey made in great heat, in which cases, an elastic litter that absorbs much moisture should be employed.

The question has arisen how far the fatigue, and even the suffering, endured by the animals in course of transport may alter the quality of their meat. It should be remarked in the first place, that there is a certain amount of mortality amongst all kinds of animals when travelling. This is especially the case with swine on account of their particular anatomical and physical characteristics such as skin that acts badly, layer of fat, small mouth opening, and narrow nostrils. The phenomenon known as fatigue-fever is caused by the accumulation within the organism of waste products such as creatin, creatinine, urea, &c., that cannot be eliminated. After the animal is slaughtered, these substances come into contact with the air, putrefaction sets in and causes the rapid deterioration of the meat. It is most important on a journey of some length to see that the animals are provided with drinking-water at very short intervals.

A steer that travelled 5 km. on foot and weighed 782 kg. at starting, only weighed 740 kg. on arrival; it furnished 426 kg. of net meat, so that its dressing-yield which should have been 54.4 per cent.was 57.4 per cent.

Many observations show that in the course of transport large losses in weight occur, the live-weight being first reduced through the evacuation of the contents of the digestive tube, and that these losses are able to affect the quantitative and qualitative yield of all butcher's animals.

Arsenic Supplies and Value in the Control of Cotton Boll Weevil.

AMBRUSTER, H. W., Arsenic, Calcium Arsenate and Boll Weevil (14 Articles and Addresses), New York, 1923.

Although this publication should not be considered as a comprehensive technical treatise or as a carefully prepared economic thesis, Mr. Ambruster has rendered a distinct service in the collection of recent articles which include most of the phases of general interest that affect and control the arsenic, calcium arsenate, and boll weevil problem.

Amongst all the other forms of poisonous compounds that have been tried, it is an undisputed fact that the calcium arsenate spray has given the most effective results, and the proper application of this insecticide is essential. This spray has hitherto not been adopted universally owing to the high cost and the difficulties in securing an adequate supply, in addition to the frequent lack of knowledge on the part of many planters. The specifications recommended for the dusting material (''Manufacturers Record,'' 29th June, 1922) which must be complied with and guaranteed on the maker's label, are as follows: 40 per cent. arsenic pentoxide, maximum 0.75 per cent. water soluble arsenic pentoxide and density 80-100 cubic inches per pound.

Government experimenters (U.S.) have devised a simple testing apparatus for determining the density, most desirable for the effective application to the plant. This should help to overcome the difficulties of standardisation for those interested in production, sale, inspection, or use of the product.

Quite recently two important improvements have been made in the manufacture of this insecticide, one in the acid production and the other in reduction of the moist calcium arseniate to a commercial dry powder. Observations have been made as to the effect of these various forms of production on the same plant, and old and new types compared. The value of the improved methods were evident, and the superior quality of both the arsenic acid and the finished insecticide in addition to the labour saving advantages. Details of these improved methods are given in the article entitled ''Calcium Arsenate Manufacture.''

A boll weevil control campaign has been organised by the American Cotton Association which aims at the co-ordination of the efforts of each existing agency and the development of all possible promising means of control of this pest. This is comprehensively reviewed under the heading of ''Cotton, a World Asset, endangered by the Boll Weevil.''

There is also included a series of articles on: Arsenic supplies and the tariff; lime-making for calcium arsenate; arsenate shortage a serious reality; arsenic and calcium arsenate supply; arsenic acid plant with nitric recovery towers; the arsenic situation; a brief for higher arsenic.

Bureau of Sugar Experiment Stations.

CANE DISEASES AND PESTS.

The following report (22nd December, 1924) from Mr. W. Cottrell-Dormer, who is investigating the pests and diseases of sugar cane, has been received by the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Racecourse, Rosella, Plane Creek, Palms, Inverness, Mindaroo, Habana, Hampden, Mount Jukes, and St. Helens were the localities visited.

DISEASES.

Several diseases of importance were met with in these parts, including Gumming, Leaf Stripe, Mosaic, Red Rot, and Pineapple Disease. From the point of view of actual damage, Red Rot has surpassed any of the other diseases mentioned.

Gumming Disease.

Most of the cane being cut at this time of the year, it is not by any means an easy matter to observe the actual distribution of this malady in the young plant and ratoon cane, since the visible signs indicating its presence very often do not appear until the cane is fairly well advanced. However, its presence was observed on two farms in young cane, the affected varieties being mainly D. 1135 and, to a far smaller extent, H.Q. 285. It having been proved that soil transmission of Gumming disease is very improbable (*vide* North) growers should especially concentrate on careful seed-selection in the control of this disease. This is only to be accomplished by becoming acquainted with the readiest means of disease detection, and I would refer growers to the writer's report for November dealing with this question. The symptoms of Gumming disease in young cane vary greatly, but the most characteristic sign is the presence of large, irregular, longitudinal white patches on the young leaves. These are seen shortly after the leaves first appear from below the soil if searched for, and are readily observed when the plant attains an age of two or three weeks. Similar signs sometimes occur on the young cane, but any doubt on the true nature of these marks may at once be settled if the set is dug out, cleaned, and cut transversely into two or three pieces; these pieces should be placed into a closed "billy can" for a few minutes; if Gumming disease is present the yellow drops of gum so characteristic of the disease will be seen to have exuded from the cut ends of the pieces. Now these plants which show these white patches on the leaves are only those which were planted from very badly diseased canes, so that for every one of these evidently diseased plants will be a great many which were planted from slightly diseased stems, and probably will not show the disease until the cane is a great deal more mature. Thus, on finding these few badly diseased plants the grower is warned not to use any cane from this field for plants later on under any circumstances. There appears to be but little Gumming disease in the Mackay district as a whole.

Leaf Stripe *(Sclerospora)*.

The bright yellow stripes and white downy mildew which denote the presence of Leaf Stripe disease were met with on two fields only, both being close to Mackay. In each case the variety affected was Pompey (7 R. 428), though but a few stools had contracted the infection; all these stools were gathered together and burnt so that the fungus causing the disease would be unable to form spores and thus infect other stools.

Mosaic.

This disease was observed in the districts of Mount Jukes, Inverness, and Plane Creek. In the first-named of these districts the disease was found to be very prevalent in Black Innis on several of the farms visited, so that growers in other localities should, if possible, personally inspect fields of this variety in this locality prior to purchasing plants for introduction into their own fields from Mount Jukes. In both of the other districts mentioned Mosaic was also mainly confined to Black Innis. A few stools of H.Q. 426 were seen near Mackay, which also showed signs of the disease.

Pineapple Disease *(Thielaviopsis paradoxa De S.)*.

Pineapple disease was met with at Te Kowai on the Palms Estate, where it has been responsible for rather serious damage over an area of one or two acres of heavy black soil. This disease is a very well known one in other countries, and has already been recorded for Queensland. It is a disease of the set and is caused by a fungus which infests the tissues of the plant and prevents it from germinating. A set infested by this fungus, if split open, is found to contain black streaks at its ends, and sometimes the inner streaks will be prolonged throughout the centre so as to meet and give the impression of a black core. This black colour is due to the formation of many thousands of black spores within the tissue of the cane. The name Pineapple disease is derived from the fruity smell accompanying the growth of the fungus. Sets are infected from the soil as a rule, since the fungus is able to thrive on many other plants and materials besides sugar-cane. Thus control measures lie in the protection of sets from fungus entry. This may be efficiently carried out by soaking the plants in water overnight in order to accelerate germination, and then treating them with Bordeaux mixture immediately before planting. Inquiries relative to this and other cane diseases may be addressed to the writer, care the Director of the Bureau of Sugar Experiment Stations, Brisbane.

Other Diseases.

Red Rot disease was found doing very serious damage to M. 1900 Seedling in the West Plane Creek District. A detailed report on this epidemic will be furnished at a later date. Red Rot was also met with at Rosella in M. 1900 Seedling, and at The Lagoon in H.Q. 426 and M. 1900 Seedling, but damage in these cases was of a minor nature.

INSECT PESTS.

Grubs.

The grey-back grub has been responsible only for minor damage this year in the districts visited, which could probably be accounted for by the unusually hard and dry condition of the soil which prevailed at the time of the last beetle flying season; many growers remarked upon the great numbers of dead and deformed beetles ploughed out by them early in the year. Grubs of *Lepidiota frenchi* were found doing rather serious damage at Hampden. This grub, which is similar in appearance to that of the grey-back, but may be distinguished from the latter by the different arrangement of the bristles on its posterior end, has a two-year life-cycle; during the winter of its first year in the soil it hibernates at a depth usually beyond that attained by the average plough, so that, although a field may have been thoroughly well tilled, cane planted in June or July is liable to attack from this species when the grubs rise close to the surface in September to complete their feeding previous to going down again during the following autumn to pupate and turn into the common brown beetle one sees flying about at dusk during the month of November. The *frenchi* grub does not usually destroy large areas of cane, but confines its activities to patches seldom exceeding one acre, so that individual farmers often think twice before spending money on equipment for its control.

Set-attacking Insects.

Four species of insects were found attacking sets and young plants during my inspections. These are *Gonocephalum torridum*, *Monocrepidius* sp., *Pentodon australis*, and a small Chrysomelid larva. Gonocephalum is a small dull black beetle which may be seen crawling over the surface of the soil in almost any field. Its larva is a cylindrical wire worm measuring ½ inch to ¾ inch, and of a light greyish yellow colour; this small wire worm is sometimes very destructive in low-lying lands, but especially where soil tillage has been neglected during the few weeks preceding planting, as the beetle will then lay its eggs profusely amongst the roots of succulent weeds such as pig weed; the young larva being deprived of its natural food when the field is planted proceeds to attack the eyes of the sets, thus preventing germination. The common wire worm (*Monocrepidius*) has been unusually destructive this year throughout the Mackay district, and I would remind growers that many farmers have found that dusting of plants with slaked lime immediately before planting is a very good preventive measure against depredations from this pest; again, if the plants be soaked in water overnight before the dusting, since wire worms are troublesome only in cold dry weather, germination is improved and the plant has a better chance of forming roots before being attacked by the wire worm. The Black Set Beetle (*Pentodon*) was met with in all parts visited, but injury was only of a very minor nature; the beetles were seen flying in hundreds to the electric lights in Mackay. The remaining insect I have mentioned above appears to be new in the annals of Sugar Cane Entomology. It is a small white grub measuring about ¼ inch,

and attacks the young cane shoots so vigorously as to often kill them outright. This grub was found doing fairly serious damage in the Richmond district; its habits are at present being studied at Meringa.

Borers.

Moth borers are to be found throughout the districts visited, but are not doing serious damage. The Beetle borer is also lightly distributed in most parts. It was found doing very serious damage to a field of Badila at Millicent, near Habana. The owner of this field stated his anxiety to obtain Tachinid flies when these were available, and is quite ready to keep a very suitable block of standover in which to liberate the flies when this is required.

CANE PEST COMBAT AND CONTROL.

The Entomologist to the Sugar Experiment Stations, Mr. E. Jarvis, has supplied the following report (30th *December*, 1924) *to the Director:—*

Cane-beetles (*Lepidoderma albohirtum*) have appeared in considerable numbers this season, and, judging by data obtained from Highleigh, Hambledon, Woree, and other localities, damage to cane from grubs of this pest is likely to be greater than that experienced during the 1923 to 1924 season. At the present time (12th December) the eggs of *albohirtum*, which in districts where 3 in. to 6 in. of rain were registered about the middle of that month, were laid about the end of November, are now commencing to hatch out, and in such localities the resultant grubs will be found in the first stage of growth from about the middle of December to the middle of January.

Grubs of the grey-back during the first instar may be distinguished at a glance by their small size, as they then measure only from $\frac{1}{4}$-in. to $\frac{1}{2}$-in. across the doubled-up body, the head being $\frac{1}{8}$-in. wide. Later on, after moulting into the second stage, they are from $\frac{3}{8}$-in. to $1\frac{1}{8}$-in. across the body, while the head is then $\frac{1}{4}$-in. in width.

The simplest way, indeed, of distinguishing between grubs of the first, second, and third instars is to examine the head, since this, unlike the rest of the body, does not increase in size during the course of individual stages, altering only when the grub moults or casts its skin. After the second moult, for example, the head attains its fullest width—viz., $\frac{3}{8}$-in., never growing larger, although a grub during the third instar more than doubles the size and weight of its body. Growers would do well to make a mental note of these various head-widths of $\frac{1}{8}$-in., $\frac{1}{4}$-in., and $\frac{3}{8}$-in.

When to Fumigate Cane-Grubs.

Second-stage grubs of *albohirtum* will probably be feeding this season until the middle of February, so that in the event of weather conditions proving favourable for fumigation of the soil grub-infested cane land could be treated up to the end of that month.

As we have experienced a rather wet December, the so-called rainy season may not set in as early as usual, in which case the ground might not, as often happens, be too wet for such fumigation throughout February.

Cane-Boring Longicorn Beetle.

In connection with the work of breeding Tachinid Fly parasites, we have recently noticed larvæ of what appears to be a secondary species of beetle-borer, tunnelling in cane sticks infested with grubs of *Rhabdocnemis obscurus*. The first of these larvæ, found by Mr. G. Bates last year at Highleigh, happened to be in standing cane, and when bred through to the imago condition at our laboratory proved to be that of *Prosoplus miselius Pasc.*, one of the Cerambycidæ or longicorns, a little beetle only $\frac{3}{8}$-in. long, dark-brown in colour, obscurely blotched with grey, and with antennæ scarcely the length of its body. When placed in a cage containing a piece of fresh cane it did not, however, attempt to bore into this, and ultimately died without having entered the stick. Additional examples were subsequently found by Mr. Bates both at Macknade and Proserpine in old fermenting cane sticks.

An Interesting Insect Pest of Sugar-Cane.

On 20th November a beetle-borer of cane was brought under my notice by Mr. Horace McGuigan, of Saw Mill Pocket, who observed that a small patch of his young ratoons from 10 in. to 15 in. high were affected by some strange insect pest, the tiny

larvæ of which were discovered by him to be boring inside the shoots, causing death of the central leaves. Examination of affected ratoons submitted by him for my inspection revealed the presence externally of tiny cleanly-cut holes about 1/16 in. in diameter, pierced in the sides of shoots from 1 in. to 3 in. or more inches above ground level. Buried amongst this debris in the first shoot examined was a plump, pinkish-white grub about 3·50 mm. long by 1 mm. in width, which, like many coleopterous larvæ, was able when removed to crawl rather quickly over the ground on the ventral surface of its body.

Specimens of these larvæ were transferred to healthy cane shoots, into which they soon commenced to bore. Nine days later they left the cane and tunnelled into moist soil in the bottom of breeding cages in order to pupate.

Strange to record, a few days after discovery of this insect by Mr. McGuigan, the presence in the Proserpine district of a pest doing very similar damage to young plant cane was noticed by Mr. G. Bates, of this Experiment Station, at Kelsey Creek and Waterson.

At Proserpine the grubs of this chrysomelid beetle are said to attack the eyes of cane-sets, tunnelling also into the newly-sprouted shoots below ground when only a few inches long. During August and September thirty or more are said to have been found under a single stool of cane.

The species in question proved in both cases to be *Rhyparida morosa*, belonging to the Chrysomelidæ, a family which includes a vast number of leaf-eating beetles of small size, very many of which—such as our well-known species of *Aulacophora* attacking cucurbitaceous plants, of *Monolepts Nisotra*, and other genera affecting fruit trees, &c.—are of considerable economic importance. It will be well to mention here that this species has previously been recorded by the writer as being a leaf-eating and cane-boring insect ("Queensland Agricultural Journal," Vol. xiii., p. 274).

Although described for the first time as a cane pest in 1915 (Bulletin No. 3 of this office), the larvæ of *Rhyparida morosa* Jac. were not found until five years later. This occurred whilst studying the economy of our smaller moth-borers, when one out of many "dead hearts" examined was seen to contain a coleopterous larva, which had eaten a central tunnel about ¾-in. long in the base of the shoot. This grub was placed in a breeding cage, and on 25th January (nine days later) transformed into the beetle condition. At the same time several specimens of the larvæ were discovered by the writer tunnelling in the succulent basal portion of stems of "blady" grass (*Imperata arundinacea*) at Pyramid. Upon tearing off the loose brown basal sheathing of these affected stems a hole in the side about 1/16-in. in diameter was exposed, out of which before many seconds a larva, if at home, usually emerged hastily tail foremost and endeavoured to escape. By aid of its spined tail and several transverse rows of abdominal bristles this larva is able to crawl over level ground rather quickly. This very common little beetle is about ¼-in. long, of very convex shape, and uniformly black and shining, occasionally with a bronze tint. Its head is hidden nearly to the eyes in the prothorax, and the antennæ are reddish-brown with eleven joints of about equal length, the first five lighter in colour, more slender, and less hairy than the remainder. The prothorax and elytra are punctulate, the former irregularly and finely, the latter coarsely, with punctures arranged in curved lines as indicated on accompanying drawing; scutellum semi-circular. Length 6 mm., greatest width 4 mm. During the heat of the day these beetles may be found resting deep down between unfolding heart-leaves of cane, and on blady grass, the foliage of which they damage.

After learning of the occurrence of this beetle at Proserpine I was surprised to receive additional specimens of the larvæ of a chrysomelid beetle (probably *Morosa*—but, unfortunately, too damaged by ants after receipt of same for specific determination) from Mr. T. J. McMillan, Secretary of the Queensland Producers' Association at Stone River, in the Herbert district, reported to be damaging young plant cane.

To receive complaints regarding this little cane pest from no less than three widely separated districts during a period of less than a month appears at first sight somewhat disconcerting.

Possibly, however, certain of our growers, having taken notice of the publication of "Monthly Hints" about cane insects, may have been on the lookout for indications of moth-borers in their young cane, the presence of which, being betrayed by "dead hearts," would naturally lead in time to discovery of this little beetle-borer which causes injury of a similar nature.

Rhyparida morosa is not likely to become a serious cane pest in the future. Headlands, &c., should, however, be kept free from blady grass, as otherwise these beetles are likely at times to encroach upon any adjoining rows of cane.

THE QUEENSLAND SUGAR INDUSTRY.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby), who has been visiting a number of the sugar areas of the State, reports that practically every sugar district has experienced a splendid season, and the crops are well over estimates formed earlier in the year.

At the commencement of the winter a guarded estimate was made, as so much depended on the season. If the winter had been a severe one crops would have suffered in the Southern areas. It was also anticipated that the cane would arrow a good deal in the North. Neither of these possible factors affected the crop, the winter was warm and showery, and the cane did not arrow to any extent but remained growing; consequently, almost every mill has increased its original estimates considerably.

At Cairns the new district known as Freshwater is producing remarkable yields of cane on the fine alluvial lands which are supplying the Colonial Sugar Refining Company's Hambledon mill. Badila is the chief cane grown, and some splendid crops were seen. From the Barron Valley line a bird's-eye view of this area can be obtained, and cane can now be seen stretching away from the main area into pockets running into the ranges.

In the older districts, such as Gordonvale and Hambledon, the young cane for next season has made a fine strike, and gives promise of a large crop again next year. The cane now being cut is weighing well, and both the Hambledon and Mulgrave mills are dealing with heavy crops. The weather for harvesting and growth of the young cane has been all that could have been desired. Both mills are doing good work and running smoothly.

Great improvements are being carried out in Cairns, which is rapidly becoming a fine city. New buildings of a substantial character are in evidence in all the main streets.

The Entomological Station at Meringa was inspected, and the work being carried out there under the supervision of Mr. Edmund Jarvis is of a highly valuable nature. Successful measures against the cane grub by means of a soil fumigant have now been adopted, and the liberation of the parasitic Tachinid fly has proved of great benefit in dealing with the weevil-borer of sugar-cane.

The cane growing on the Kairi State Farm, on the Atherton Tableland, was visited, and it was found that this had made very fair growth considering rain did not commence till February following the severest drought ever experienced on the Tableland, and this year there had only been 27 in. of rain till October. Last year eighty-seven successive frosts were experienced. This year only two light frosts were recorded. The cane is healthy, and a good demand exists in the coastal areas for Tableland Badila.

At Babinda the crops were very heavy, and the mill expects to deal with 200,000 tons of cane this season, while the prospects for next season are also excellent. The mill work is going on well, and good results are being achieved.

The Innisfail or Johnstone River district is in a highly prosperous state. Each of the three mills is crushing up to full capacity, and there are some exceedingly fine crops of cane in evidence. The Goondi mill was doing fine work, and expects to get through its big crop by about the third week in December. At the time of the Director's visit Innisfail was suffering from one of its occasional short droughts, and the dust was pretty bad. Steps are being taken to overcome this by the construction of fine footpaths and roads. Up to the end of October about 130 in. of rain had fallen. The young cane looked well, and a big crop for next year seems assured.

The South Johnstone Central mill was dealing with a vast amount of cane, which it was crushing at the rate of some 6,500 tons per week. About 165 tons per day were also being railed to the Giru mill on the Haughton River, south of Townsville, from areas ranging from Liverpool Creek to the new Tully mill site, in order to relieve the South Johnstone mill, which up to the end of October had crushed over 136,000 tons of cane and manufactured over 16,000 tons of sugar.

The average c.c.s. at the end of October was 14·3 per cent., the average for the season being 12·75 per cent. It is stated the mill has worked much better this year in respect to lost time. It is anticipated that a larger supply of cane will go forward to the Giru mill a little later on as there is a large supply still in sight.

The Mourilyan district was looking very fine, the young cane being well forward and vigorous. This mill also had a large crop to put through.

A great improvement in cultivation has taken place in recent years. The use of the tractor enables farmers to do much better work in deep cultivation and to give more frequent ploughings. Pests and diseases were not greatly in evidence.

The cane crop at the Experiment Station had been cut, and the results were exceedingly good, the average tonnage for the Station from plant, second, and third ratoons being 35 tons per acre on what may be termed poor land—considerably higher than the average yield of the district.

The raising of new seedling canes is giving very promising results, and many of the new canes are of excellent apearance, and a number have shown satisfactory c.c.s. figures in recent trials. Mr. McWalters, the chemist in charge, has taken considerable interest in this work, which is of a highly creditable nature. The whole station presented a good appearance, and is well kept.

The Herbert River areas, embracing Ingham, Halifax, and Macknade, presented evidences of great prosperity. This year's crops are very fine, and large amounts of new land have recently been put under cultivation, a good deal of which was not considered suitable in previous years. Growing conditions have been exceedingly favourable. Thunderstorms had started early, with some heavy rain showers. An immense area has been planted for next season, and the young cane is coming on splendidly. Some considerable doubt has been expressed as to whether the mills can deal with all the cane if the season fulfils its present promise. A morning was spent at the Colonial Sugar Refining Company's nursery at Macknade, where a number of interesting trials are being carried out under the supervision of Mr. K. Garde.

The Mackay cane areas are experiencing probably the best season yet recorded. Not only are the yields of cane excellent, but the commercial cane sugar in the cane is remarkably high, due to four months of dry weather following good rains. The plantings for next year have also been good, and much new land is coming under the plough. If the present shipping strike does not interfere, most of the Mackay mills will crush till nearly the end of December, though North Eton and Palms with smaller crops expect to finish this week. Owing to the high quality of the cane, the mills have been taking relatively low tonnages of cane to make a ton of sugar, figures as low as 6½ tons of cane per ton of sugar having been realised. A good deal of wet weather has been experienced in parts of Mackay during this month.

Much of the older lands in Mackay have been under cane for fifty years, and require much liming, green manuring, and fertilising to enable them to grow good crops of cane. The new lands south of Mackay and to the north, which have recently been brought into cultivation as the result of the opening of the North Coast Railway, are yielding very promising crops of cane, and will, it is hoped, solve Mackay's problem in the past—viz., too many mills for an insufficient cane supply. The work of the Experiment Station has been exceedingly useful to growers, and some excellent varieties have been distributed this season.

At Bundaberg conditions have materially improved during the past three months, and in almost every case mills have increased their estimates. This has been due to the mild winter and the good rains that have fallen.

The present season will be a record for Queensland, every mill practically crushing up to its full capacity, and should no hitch occur a very high tonnage of sugar will be produced.

THE INDUSTRY IN THE HAWAIIAN ISLANDS.

The Director of Sugar Experiment Stations has received the following letter from Mr. Arthur F. Bell, one of the three students sent abroad in connection with the Sugar Industry. As Mr. Bell's letter is of general interest to canegrowers, it has been made available for publication.

I take this opportunity of acquainting you of my recent activities, and will make my official report to the committee early next year. I arrived in Honolulu on 7th December after a very pleasant voyage on the "Niagara." Mr. H. A. Lee, the Chief Pathologist of the H.S.P.A. Experimental Station, was absent on Hawaii Island at the time of my arrival, but his assistant, Mr. C. C. Barnum, met me at the wharf. Mr. Ekhom, Chief of Quarantine, and Mr. A. H. Ford, Director of the Pan Pacific Union, also welcomed me. Thanks to the good offices of Mr. North, my reception at the H.S.P.A. was most cordial, and I greatly appreciate the courtesy and attention that I received from the officers of that institution, both in their official and private capacities. I was enabled to see most of the island of Oahu during my stay there, and visited Waimanalo, Waialua, and Waipaha plantations. The cane on all three

was very free from disease, although I noticed a fair amount of mosaic on parts of Waialua. Mosaic, by the way, is the worst disease on these islands. H.109 is practically the sole variety on these plantations, and is yielding some wonderful crops. Two overseers informed me that H.109 when first introduced to a plantation sometimes takes a few years to establish itself and obtain its usual standard of excellence. In view of this, it might be advantageous to continue trials with this variety in different parts of Queensland. These three plantations are all irrigated in the dry season, and on Waipahu the Oahu Sugar Company brings its water supply through the mountains *viâ* a tunnel 8 miles long, and pumps 100,000,000 gallons daily. Most of the plantation labour is done by contract, the Japanese and Filipinos contracting for weeding, planting, &c., at so much per acre. Where day labour rules the wages are from 1 dollar to 1·50 dollars per day. The Experimental Station staff are now working on the practical control of Eyespot disease (*Cerospora Sacchari*), the method being to dust periodically with a fungicide. Should these trials be successful, they propose to enlist the services of aeroplanes for dusting operations on a big scale. The staff were greatly interested in the two specimens which I brought over—viz., the flowering parasite of cane and the disease resembling Iliau. The parasite was not known by the Pathologists, and Mr. Lee has forwarded the sample to Berkeley. I submitted the other sample to Dr. Lyon, who unhesitatingly pronounced it to be Iliau disease, and on microscopic examination I found the unmistakeable spores of *Melanconium Iliau.* In case you have no literature dealing with Iliau, I will include these few notes:—Iliau is a disease of sugar-cane, previously confined to Hawaii and investigated by Dr. H. L. Lyon in 1910-12. The only conspicuous symptom is the cementing of the leaf sheaths into a tight unyielding jacket around the stem, thus preventing further growth, and finally death. Leaf sheaths killed by the fungus are pinky-brown in colour, and if the shoot has produced any stick the rind is a bluish-grey colour. The disease is caused by the fungus "Gnomica Iliau," which, however, is usually present in the imperfect form—*Melanconium Iliau.*" The spores of the Melanconium type are formed in the interior of the diseased shoot and rarely on the outermost leaf sheaths, and thus can only escape after the disintegration of the shoot. The spores are readily killed on exposure to sunlight, but if kept in darkness retain their vitality for a considerable time. They do not germinate readily in water, and are thus adapted for dissemination by water. Iliau attacks young shoots of cane, entering the leaf bases which grow from the stem at a point below the surface of the soil.

The mycelium of the fungus rapidly travels through the tightly packed leaf sheaths, which surround the growing point, and cements these, the whole forming an inflexible cone which effectively prevents any further upward growth of the stem. On splitting open a young shoot one frequently finds the growing point bent back upon itself in an endeavour to escape from its prison and continue its elongation. Occasionally this bending will split the cone of leaf sheaths lengthwise and a loop of the shoot will protrude. It is possible, under favourable conditions, for a shoot which has contracted the disease to enter upon a period of rapid growth, in which case the growing point is carried beyond the zone of infection and thus the shoot "grows out" of the disease and suffers little harm. Iliau, being a disease of young cane shoots, is most prevalent in fields which are less than half grown, and is usually much more severe in fields of plant than of ratoon cane. Cane which has been weakened in any way, as by drought, or a disease such as Mosaic, is much more susceptible to Iliau than is healthy cane. Iliau thrives, to any extent, only during cool moist weather. It usually destroys a few shoots in each stool but has been known to cause total loss over considerable areas. Owing to the fact that a large percentage of the death is caused in young shoots just emerging from the soil, the magnitude of the actual loss sustained is not always appreciated by the farmer. Any shoots which are infected while less than 10 inches high are almost certain to succumb to the disease. As regards the control of Iliau we must resort to measures which are preventive rather than curative. The infected leaf sheaths are so securely cemented together that stripping them is almost certain to injure the growing point, and so this method of control is rendered impracticable even in small areas. Soil which has become infected with the spores of the Iliau fungus should undergo a very thorough preparation before replanting. Since the spores and mycelium are destroyed after a few hours' exposure to sunlight, the more times the soil is worked the greater are the chances for the eradication of the disease. The time of planting should be adjusted in order that the cane may have attained a good stand before cool damp weather is likely to prevail. As the outbreak in Queensland is probably still limited in extent, and as, moreover, the Melanconium spores are only liberated on the disintegration of the affected plant, I would urge that the Department strongly advise the farmers to tear out and burn all diseased shoots. It is, of course, necessary to tear out that part of the shoot which is underground. By this means it is possible that the disease can be practically eradicated, if measures are promptly taken.

RED ROT.

The Director of the Bureau of Sugar Experiment Stations has received the following report (30th December, 1924) from Mr. Cottrell-Dormer, who is investigating pests and diseases in Sugar Cane:—

Notes on the Epidemic of Red Rot in M.1900 Seedling in the West Plane Creek District—Spring, 1924.

"Forewarned is forearmed." The growers of the West Plane Creek area—by the ravages of Red Rot disease in M. 1900 Seedling—are indeed warned. Let them now make it their business to be well armed against further outbreaks of this potential cane disease.

Certain important features of this epidemic cannot fail to have been observed by the most indifferent of the growers concerned: (1) The disease occurred, to a slighter degree, in their fields of M. 1900 Seedling last year after a period of drought. This diseased cane, unless almost killed outright, was in many cases used indiscriminately for plants, which, as shall be explained further on, is a most dangerous and irrational procedure; (2) the soils of the West Plane Creek area are mostly black, heavy, and of a non-porous nature, and if, for financial or other reasons, cultivation is neglected during the course of dry weather, they become hard and caked. This makes for a faster evaporation of soil moisture and a defective soil aeration; (3) the varieties M. 1900 Seedling and to a less degree M. 189 have shown marked susceptibility to this disease, while Q. 813 (and some others) has shown great resistance. On a true appreciation of the importance of these three features is based the control of Red Rot and kindred diseases, as a brief discussion will show.

(1) While cutting plants in an infected field the grower will often observe a slight red tinge in the visible flesh of the cane; in nine cases out of ten if the day is hot this will pass unchallenged and the affected stick is cut up with the remainder; in most cases the grower realises that a mistake is being made but is prepared to risk the consequences. Should he pause to consider the matter, let him split both stick and plant—he will notice that this red discoloration traverses one or more internodes, is variable in width, and is broken here and there by a short narrow transverse white patch, and if the disease is fairly well advanced one or more of the nodes have a dried and woody appearance. These signs at once show the presence of Red Rot disease, and could be found in every affected stick during the recent epidemic. These peculiar markings are caused by a fungus known as *Colletotrichum falcatum* which invades and poisons the tissues of the cane. To obtain a better understanding of the nature of the disease he is combating, the grower could now try a simple experiment in Plant Pathology. Let him obtain a clean kerosene tin and two clean "140 lb." sugar bags; the latter should be well soaked in water and thoroughly wrung out; one bag is roughly pushed well down in to the tin; a fresh piece of split cane showing the above-mentioned symptoms is now rested amongst the folds of this bag and the remaining bag folded and placed carefully over the top of the tin and kept moist by sprinkling with a little water two or three times a day. A moist atmosphere is thus created which will cause the fungus to grow again where it has been severed by the knife in splitting. The piece of cane should be examined morning and night. After thirty-six hours will be seen forming at nodes and white patches a fluffy white mould which is a continuation of the growth of the fungus already within the cells. The average grower has not the time to spend studying this with a microscope, so let him refer to Fig. 1, which shows the fungus strands actually within the cells of the cane at one of the white patches.

After three or four days he will observe that this mould has turned to a light-grey colour, and that at certain parts of the section, and sometimes of the rind, particularly those in which the disease is well advanced, some very small black spots have appeared. This is know as the fruiting stage of the fungus, and being so small the black spots are not easily observed in the field unless very plentiful. If these spots were now carefully examined with a fairly powerful lens, they would be found to consist of many very tiny black bristles, as seen in Figs. 2 and 3.

At the base of these black bristles the microscope would show a number of very small spores, and, further, it would show that these bristles and spores have been formed by the fungus growing within the cells of the diseased cane. These are the seed of the fungus, and germinate very readily in suitable conditions by sending out a thread of fungus, which is capable of growing and branching out in the cells of weak cane. Other spores are formed amongst the grey mould which, being invested in a particularly strong shell, are capable of withstanding adverse conditions for a considerable period, so that control measures should be unremittingly adhered to. The grower will now fully realise that each red-ended plant sown is a source of

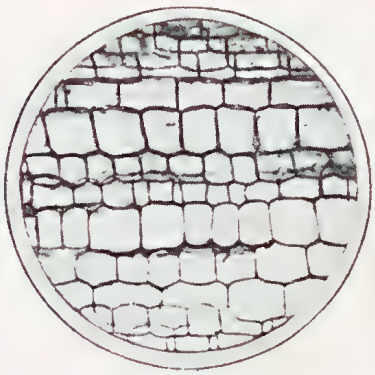


FIG 1.

Photograph of a thin longitudinal slice of Flesh of Sugar-cane showing invasion of cells by fungus *mycelium* in upper half. Lower half free. × 38.

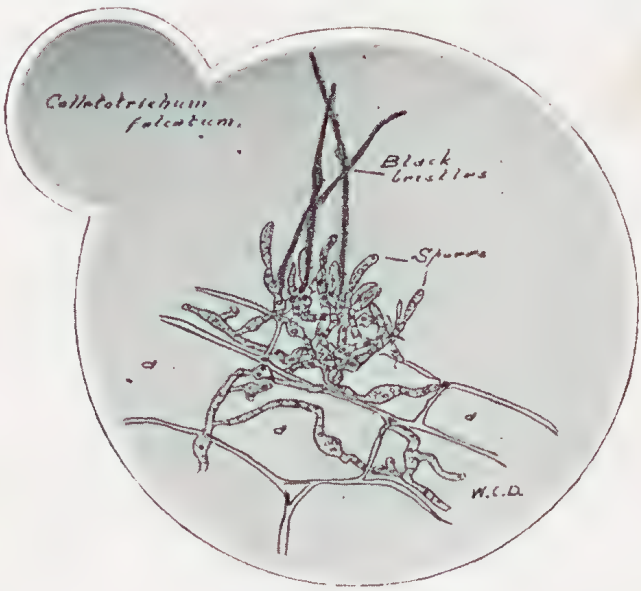


FIG. 2.

Semi-diagrammatic camera-lucida sketch of ascervulus or fruiting stage of fungus a. a. = *parenchy inataus* cells. × 210.

FIG. 3.

Photograph of a thin longitudinal slice of cane from node, showing minute black bristles of *ascervuli*. × 40.

infection to the stool which grows from it. The plant will, unless very badly injured, germinate quite well, and the stool will later on appear to be quite healthy; nevertheless, the Red Rot fungus will remain about it breeding on leaf sheath bases, wounds, aerial roots, &c., so that should the stool become weak and unable to resist the fungus it will readily fall a victim to its insidious enemy. Therefore growers of the Plane Creek district should be especially careful in the selection of their plants, and, if possible, draw cuttings from healthy fields only—or at least from healthy stools. This advice is somewhat late for the present season, but this should in no way detract from its importance in later plantings. It is not, of course, possible in an infected district to plant only sets which are absolutely free from Red Rot fungus—a few infected plants are bound to find their way into the field in spite of the strictest supervision, and will constitute an unavoidable minimum of infection; to prevent this minimum from increasing, the cane must be helped in other ways—*i.e.*, by efficient farm practice.

(2) Red Rot disease will not cause serious injury to cane which is in a healthy and vigorous condition; it does its damage in fields where the cane has already been weakened by root diseases, by poor soil conditions, or prematurely ripened by drought. It enters the canes through the root eyes, through wounds caused by insects, or by cultivation. Besides being a cane parasite, the fungus is able to live on undecayed stools.

The West Plane Creek soils, being of a very heavy nature, require careful manipulation in order that a healthy deep culture of aerobic bacteria may be maintained, without which the cane will not preserve its health; effective soil aeration must be obtained before this can be done. Red Rot disease was found at its worst where soil aeration was very defective. To remedy this affected growers should drain the lower portions of their fields, apply heavy dressings of lime, and plough in leguminous green manures as frequently as is practicable—the use of leguminous green manures acts also as a very effective rotation crop in the control of many cane diseases. The bed system of planting should be fully exploited. In fact, all measures tending to enhance the general wellbeing of the cane will help it in its fight with root diseases which predispose it to attack from Red Rot. Further information concerning the soil of individual farms could be obtained by having the soil analysed by this Bureau when erstwhile unknown defects could be detected, and advice obtained for their rectification.

The effects of drought should be checked as far as a farmer's means will allow by constant surface tillage, as premature ripening can only be checked in this manner —*i.e.*, by breaking up the capillary tubes which drain away the necessary soil moisture when the sun is strong and the dew point low.

(3) Great use can be made of the knowledge that certain varieties are very resistant to Red Rot disease. Q.813 is one of these resistant canes; D.1135 is more or less resistant. Most of the growers in the Plane Creek district have both Q.813 and M.1900 Seedling on their farms. When the time comes again for planting of fields where the disease has made itself felt, Q.813 or some other suitable resistant variety should be used on the infected field (after liming and green manuring) instead of M.1900 Seedling. The latter should in turn be planted where the resistant variety has grown, a form of rotation is thus obtained. Provided only healthy cane has been used for plants, this will go a long way in the suppression of Red Rot.

Summary.—As Red Rot is such a very serious disease, and threatens the life of their most valuable cane, growers of the West Plane Creek area should exert themselves by combined action in improving the general health of this variety—M.1900 Seedling. In order to better understand the nature of the disease, a brief study should be made of it as outlined in the beginning of this paper; the planting of cane from diseased fields must stop; soil texture and soil sanitation must be improved; and rotation of crops and varieties should be practised.

It is quite possible that the coming season will prove a very good one and the cane show very little Red Rot. Farmers must not let their vigilance be lulled thereby, as this but shows the treacherous nature of Red Rot and kindred diseases which lie in a more or less dormant state during the good seasons only to attack the unsuspecting farmer with the greatest vigour when Nature fails him.

PHALARIS GRASS.

The following note on *Phalaris coerulescens* is abstracted from a Departmental report by Mr. J. Liverseed, Manager, State Farm, Hermitage:—

An area of 9 acres was planted on 17th and 18th July, 1924, and harvested 23rd November, 1924. The weather conditions during the growing period were favourable, 1,223 points of rain having fallen from seeding to harvesting. The crop, however, suffered somewhat before harvesting through the ravages of caterpillars. The crop

was cut with the binder. I measured off an area of 1 acre of the plot to ascertain the average, which resulted as follows:—

	Tns.	ct.	qr.	lb.
Hay	1	15	2	0
Seed	0	4	1	7
Chaff and cavings	0	8	0	0
Straw after thrashing	1	3	0	21

This grass was first grown by me in 1914, the seed being obtained from Mr. W. Stevens, Head Teacher, East Warwick State School, the name given being *Phalaris*

PLATE 13

coerulescens. Some seed of a grass called Garland Grass was also received from Mr. Martin, of Cawdor, near Toowoomba. These two grasses I found to be annuals and of the same habits of growth and other characteristics. In the course of the year 1919 specimens were forwarded to the Department for identification, and named by the Botanist, Mr. C. T. White, F.L.S., as *Phalaris minor*. When seeded in autumn this grass provides an abundance of green feed in winter and early spring, and if freed from stock will then give a good return in hay. It is readily eaten by all stock when green feed is scarce during the winter months. I have compared it with oats and barley under favourable autumn and winter conditions, and have found it more suitable for green feed under frosty and hard winter conditions, which do not affect its growth. The month of April is about the right time for seeding. The quantity of seed required per acre is—through lucerne box, 8 lb. to 10 lb.; by hand, 12 lb. to 15 lb.

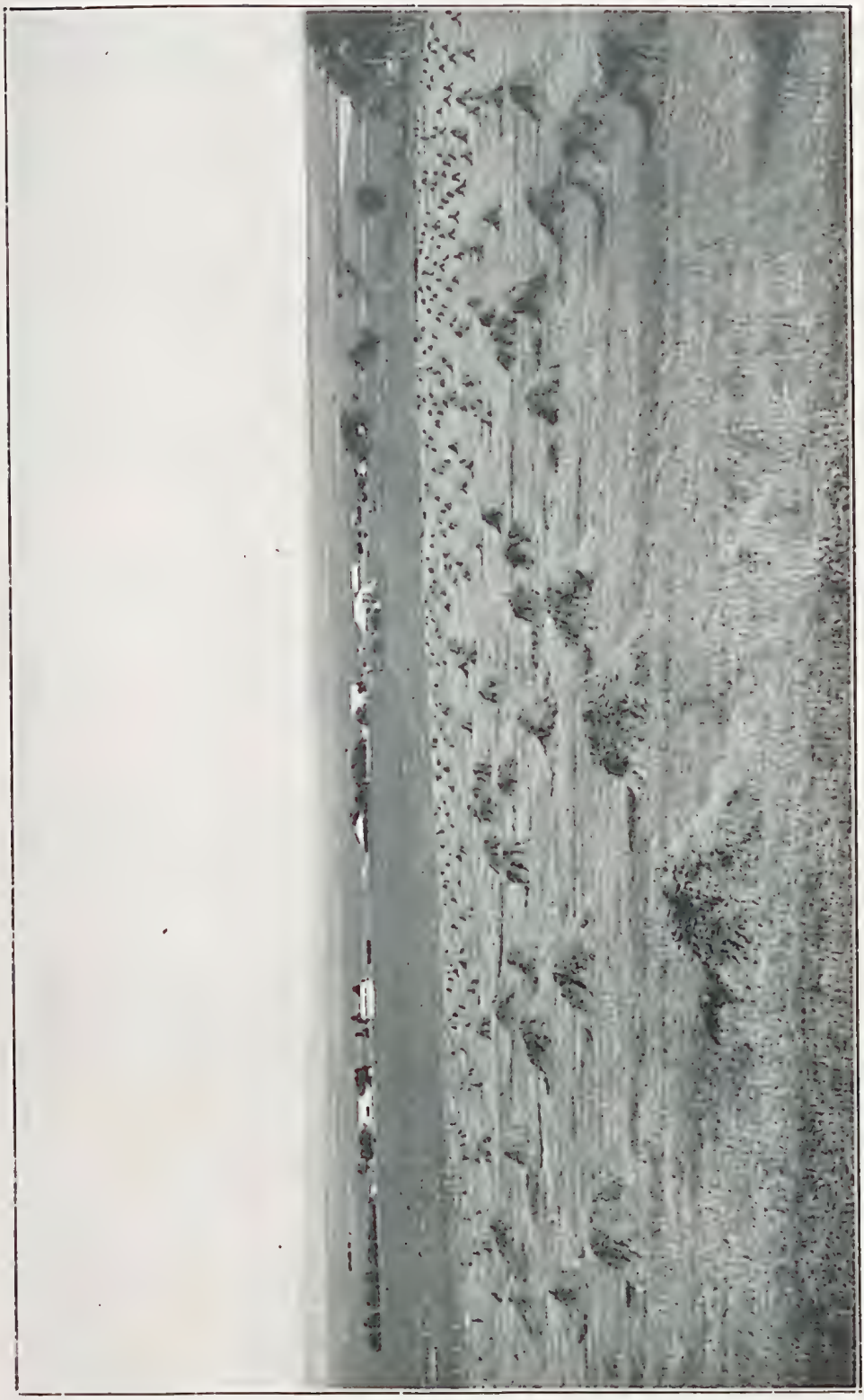


PLATE 14.—A FIELD OF CANARY GRASS (*Phalaris*) IN STOOK, HERMITAGE STATE FARM, DARLING DOWNS.

FIELD REPORTS.

Mr. E. H. Osborn reports (17th November, 1924) to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Myola.

This new area is situated upon the Cairns-Herberton Railway, about 24 miles from Cairns, and at an altitude of 1,096 ft.

Formerly it was dairying country, but the present owner is growing cane for the Mulgrave Central Mill. Originally the land was a light scrub carrying silky oak, hickory, and other local scrub timbers, but the portion now under cane has been under grass and dense lantana for a number of years. The latter has evidently helped to loosen up the soil wonderfully, and has also acted as a useful manurial agent.

At present about 30 acres are planted with Badila, mostly from Freshwater, but some also from Atherton. Considering the cultivation was hurried, the plants have struck remarkably well, the cane showing a vigorous and healthy growth.

The soil consists of a yellowish to greyish, very light loam, working up surprisingly well, so much so that most of the post holes in the new fence were sunk without the aid of a bar.

The average rainfall for Kuranda (3 miles away) for the last five years amounts to 74.92 in., against an average for Cairns of 89.86 in., while for 1923, the lowest for many years, Kuranda totalled 49.93 in., against 53.55 for Cairns.

Hambledon.

Throughout Waree, Wah Won, Hambledon proper, and the Sawmill Pocket a very large area of healthy young plant cane and splendid young ratoons were noticed. At Hambledon a very fine block of 14 acres August planted H.Q.426 was noticed upon Mr. Jno. Mann's farm. This was beautifully worked up and looked a picture. This particular paddock has been under cane since about 1882, and is an example of what can be done with good cultivation.

Adjoining the pocket a block of some 64 acres of land that was hardly considered good enough for cane has been planted by Cochrane and Sons with D.1135. It looked remarkably vigorous, was very clean, and stooling out well.

Mulgrave Areas.

Fine strikes and excellent crops of ratoons were seen, but a good shower would give a great impetus to the already very promising crop for 1925.

Throughout Aloomba the same promising crop conditions for next season were observed. One particularly good crop of first ratoons, considering how very late it was cut, was noticed on Mr. S. W. Warner's farm.

Little Mulgrave Area.

The main road to this area is very narrow, and passes through rich alluvial flats in most places, and is consequently very much cut up by the two 5-ton motor lorries carting two trucks of cane each to the end of the temporary line in the bed of the river. The cane is first of all loaded into the trucks in the field and drawn over rails by horses to a loading bank, from where it is transferred to the motor lorries. Another team is then required to pull the trucks about another 2½ miles to the permanent engine line at Dry Gully. This helps to make cane harvesting here a very expensive item.

Babinda.

Although this area was much greener than either Hambledon or Mulgrave, rain was wanted. Generally speaking, the prospects were very good indeed, and the mill was still doing very good work. The harvesting conditions were also very fine, for up to the 25th October some 117,000 tons of cane had been crushed, of which only some 0.6 per cent. had been burnt; naturally the cane was in good order for crushing.

Amongst different paddocks visited was a very fine 20-acre block of July planted Q.813 belonging to Dr. Knowles. This looked extremely well and showed careful cultivation.

Upon Mr. W. Lennon's farm some extremely good first and second ratoons H.Q.458 recently cut had stooled out very well indeed. This had been planted mostly in low-lying wet places upon the farm. When this cane was cut at ten months old its average c.c.s. was some 2 per cent. lower than the mill average, but it cropped heavily.

Diseases.—Quite a lot was said in last month's report upon disease (mainly Leaf Scald) in the Cairns and Babinda cane areas, and the more the area is gone through the more the remarks are justified.

At Aloomba, for instance, a block of first ratoon N.G.15 that seemed bad six weeks ago now seemed worse.

Also in the same area a 21-acre paddock of H.Q.426, first ratoons, shows very heavy damage, numerous stools having died completely out. Blocks of first and second ratoons (N.G.15) belonging to the same owner also showed odd stools here and there affected.

Near the Babinda Mill, a paddock of second ratoon N.G.15, which showed many signs of it last year, is in a far worse state now, stools having quite died out in very many places.

Nearby another paddock of Badila and Green Goru first ratoons also show plenty of affected stools. Upon inquiry it was learned that the plants had been obtained from the farm just spoken of.

Towards Mirriwinni odd stools were noticed on several farms; two cases were noticed whilst riding along the road.

In every case care was taken to advise the owners and to impress upon them the absolute necessity of their using none but the very best of plants, of ploughing out all diseased fields, and, if possible, letting them lie fallow for a time.

Proserpine.

All previous crushing records had been broken. Some 44,480 tons of cane had given an average density of 15 c.c.s., and the mill authorities expected to put through another 1,500 or 1,600. Most of the growers were cutting over their estimate, and this, coupled with the high average density, made every one well pleased.

The district is growing rapidly. The advent of the North Coast Railway has helped this along considerably by showing to outsiders the value of the Proserpine lands as a canegrowing proposition.

Mr. E. H. Osborn, Northern Field Assistant, reports under date 19th December, 1924:—

Proserpine.

Rain in November interfered somewhat with the harvesting operations and naturally caused a drop in the c.c.s. It also helped on an already fine crop of weeds. This, coupled with the fact that there had been a decided shortage of farm hands, made it a difficult matter to get necessary work done at the right time. Next year's prospects are bright, due to the increased area under crop and the large proportion of plant cane. A widely scattered area of young plant suffered very severely from the depredations of a very small creamy grub probably about $\frac{5}{8}$ in. by $\frac{1}{8}$ in. diameter. The July planting seems to have suffered most, the young shoots being generally attacked near their base and gradually tunnelled right up. Near some of the sets as many as a dozen of these grubs were picked up. One well-known Kelsey Creek grower says that he only obtained a 25 per cent. strike from a 6½-acre block of M. 1900 and H.Q. 426; the latter cane was nearly eaten right out. He also mentioned that he had excellent results from April and September plantings.

An officer of the Entomological Branch, who was liberating Tachinid flies to control borers, had his attention called to this pest, and in consequence collected a number of the grubs to take to Meringa for observation. From inquiries made, this minute grub has been known in the area for many years, but had never done so much damage previously. Locally, it was known as a "wire worm."

Bowen.

This centre was looking particularly green and healthy, having up to date experienced some 35 in. of well distributed rain. The crops were cutting well up to the estimates, and some high density figures had been recorded. Since my last visit several new growers had started, and with favourable weather conditions a good tonnage should be harvested in 1925. Among the new growers is Mr. C. Boulter, with some 22 acres of deep alluvial soil, part of which was planted in April. The Badila and Green Goru planted then looks uncommonly well, showing many very solid sticks of young cane. Although this was new cane land it had been under other crops previously, and so the present owner is trying the effects of manuring with different fertilisers. So far, the fertilised portion looks much better than the

other. The farm shows very careful cultivation, and there seems to be a fair amount of available water for irrigation.

On Mr. J. Stackleroth's farm some plant H.Q. 409 was seen growing, looking well, too. It will be interesting to see how this variety does under Bowen conditions, for it is a cane that is grown more freely in the Ingham district than elsewhere.

Bloomsbury.

This area is situated upon the North Coast line, some 22 miles from Proserpine, and at an altitude of 142 ft. as compared with the latter's 28 ft. Generally speaking, the river here runs in a northerly direction, and the cane land consists of the rich, low, well-drained, dark alluvial flats upon its banks. Some half a dozen farmers are now in residence, two of whom supplied cane to Proserpine this season. The principal of these, Messrs. Biggs Bros., have harvested about 20 acres, but hope to cut 38 acres in 1925. The cane grown is mainly H.Q. 426, Q. 813, M. 1900, N.G. 24 B., and N.G. 15. The two former especially have given excellent results, and N.G. 15 (Badila) planted early looks very pleasing. The ratoons, too, upon this farm show excellent growth.

On the same side of the river Mr. A. C. Hall will cut some 9½ acres next year. This little patch looks fine.

On the railway side of the river Mr. J. Gorton has some 33 acres and Mr. Glen Gorton about 12 acres, whilst further down Mr. R. G. Johnston is planting some 60 acres for next year. Probably 150 acres of cane land will be harvested next year. There are three tractors at Bloomsbury.

Banana Pocket.

Harvesting was in full swing, and was being carried out much more expeditiously than last year. The mill has kept faith with the growers and a small loco. is pulling cane from the Pocket to "Gunyarra" on the Government line, where there is also a steam winch for derricking. Some excellent cane has been railed this season, and the ratoons have also got away well, but owing to the shortage of experienced farm labour, several growers had not done any ratooning. One fine patch of N.G. 15 and N.G. 24B belonging to Mr. E. H. Lascelles, showed very careful cultivation, as did also some well worked up Q. 813 ratoons on Mr. G. Greenwood's farm. Tractor power is well represented.

The most popular variety here at present is Q. 813, being a quick growing splendid striking and high density cane, and giving good crops on poor to medium ground. Owing to many causes a lot of the young cane struck badly. M. 1900 also grows very well, and seems to favour low-lying areas; it also ratoons well, but is not as good a striker as Q. 813. H.Q. 426 is also giving excellent returns, both for density and for tonnage; it has also ratooned well. Several good crops of N.G. 15 were also noticed.

A large quantity of artificial fertilisers is being used here with good results, but the writer has seen very little green manure, such as peas or beans, grown, and also very little trash ploughed in. The great help that these give to the action of artificial fertilisers cannot be over-estimated.

Lower Burdekin.

When this district was visited early in December the effect of the earlier rain experienced had worn away and practically all the irrigating plants were operating.

The three district mills were all expecting to finish early after each had handled a bigger crop than expected by the earlier estimates. Density is fair, but not up to the usual local standard. Next year's prospects look particularly bright. A large proportion of the crop will be early plant, and both this and the late plant show fine growth. The ratoons also are looking exceptionally healthy, for a far bigger proportion of them have been thoroughly well worked up and manured than is usual upon the Burdekin.

It was also pleasing to notice that quite a number of growers have gone in for green manuring, and a number are also ploughing trash in. The use of green crops is no doubt partly due to the favourable season, but in the Kalamia area it was certainly helped by the fact that since the Kalamia management started canegrowing their field manager, Mr. R. Goddard, has persistently advocated green manuring, more particularly in a dry area like the one under review.

The same applies to ploughing in of trash. Quite a large acreage has been ploughed in by them after being gone over four times by a Tandem disc harrow. In this particular area some fine N.G. 15 April plant was noticed, having stooled very well and carrying a good wide leafed top. Further away a 24-acre paddock

of H.Q. 426 and B. 208 had been alternately manured with Nitrate of Soda (two applications) and Fish manure, with non-manured check plots in between. Local experiments such as these, especially where the resultant cane of each plot can be accurately weighed, are of much benefit to other growers.

Gumlu and Broadlands.

These areas are situated 26 miles south from Inkerman mill and upon the North Coast Line. There are now some fifteen odd growers with cane planted for next year. The past two years have given the area (non-irrigated) such a bad time that practically all the cane plants had to be brought from elsewhere.

The soil hereabouts is of an excellent quality, varying from a deep dark to a brownish and sometimes slightly sandy loam, all capable of yielding crops of cane with either a good rainfall or fair supply of underground water. The land under crop is situated adjacent to and parallel in a fairly narrow strip with "Monogle Creek," which runs between the sidings of Gumlu and Broadlands.

The most favoured cane variety this year is Green Goru, N.G. 24B, but Red Goru, M. 1900, H.Q. 426, N.G. 15, and a few lines of Q. 813 are also doing very well.

The several paddocks of cane looked healthy and compared favourably with non-irrigated cane growing upon the Burdekin. Most of the areas planted (30 acres of which would be probably the largest) showed good cultivation and freedom from weeds. There were three tractors in use in the area.

Mr. J. C. Murray, the Southern Field Assistant, reports under date, 17th November, 1924.—

Mackay.

The sub-areas at Mackay visited were Farleigh and Sarina. A visit was also made to the new farm lands being opened at St. Helens, N.C. Railway. The farming standard is high at Farleigh as regards cultivation. There is still the same need, however, for green manures. The most serious matter that the growers must consider is plant selection. Unconscious planting of sets affected with disease, especially Mosaic, will cause the growers uncomfortable losses in the future if this question is not considered seriously. Recommendations as to planting have frequently been made with regard to this disease.

Parasites affecting the cane were Rust, Smut (a parasite attacking the sticks and spindles of several varieties), and Leaf Stripe, a fungoid parasite evidenced by a downy mildew underneath the leaf. The control of all these parasites devolves into the matter of careful selection of plants.

Farmers are recommended to discard Shahjahanpur No. 10, as this variety is very susceptible to disease in this district. It is probable that Mosaic is endemic in this cane. Very high densities have been obtained from time to time at Farleigh Mill this season. The company has had a busy time with very little industrial trouble. In fact, in the Mackay district generally the industrial organisations appear to be in very capable hands.

Sarina.

Crushing has been a heavy one this season and the average density of the cane has been high. The mill is about at its full capacity now, so that for the present it would be a mistake for fresh areas to be planted unless the farmers could be assured of getting the cane crushed. Queensland generally is faced with a very serious problem, the question of possibly having to restrict development in the sugar areas. The crux of the situation is the successful exportation of the surplus, and this can only be brought about by high industrial efficiency.

The growers in the Sarina area are at present having considerable loss through disease in the M. 1900 Seedling. A careful examination of the cane was made and diseased sticks were found to be affected as follows:—Tops partially dead, eyes attacked by fungus, copious growth of adventitious roots, red fibre, and roots underground attacked by fungus. Where the affected cane had been cut and ratooned there was no particular deterioration noticed, although no doubt as the ratoons make cane the affected root system will be unable to maintain growth. Farmers are advised to thoroughly cultivate, drain, and lime the soil where the cane is affected in this manner, and only bring plants from where the M. 1900 Seedling is healthy.

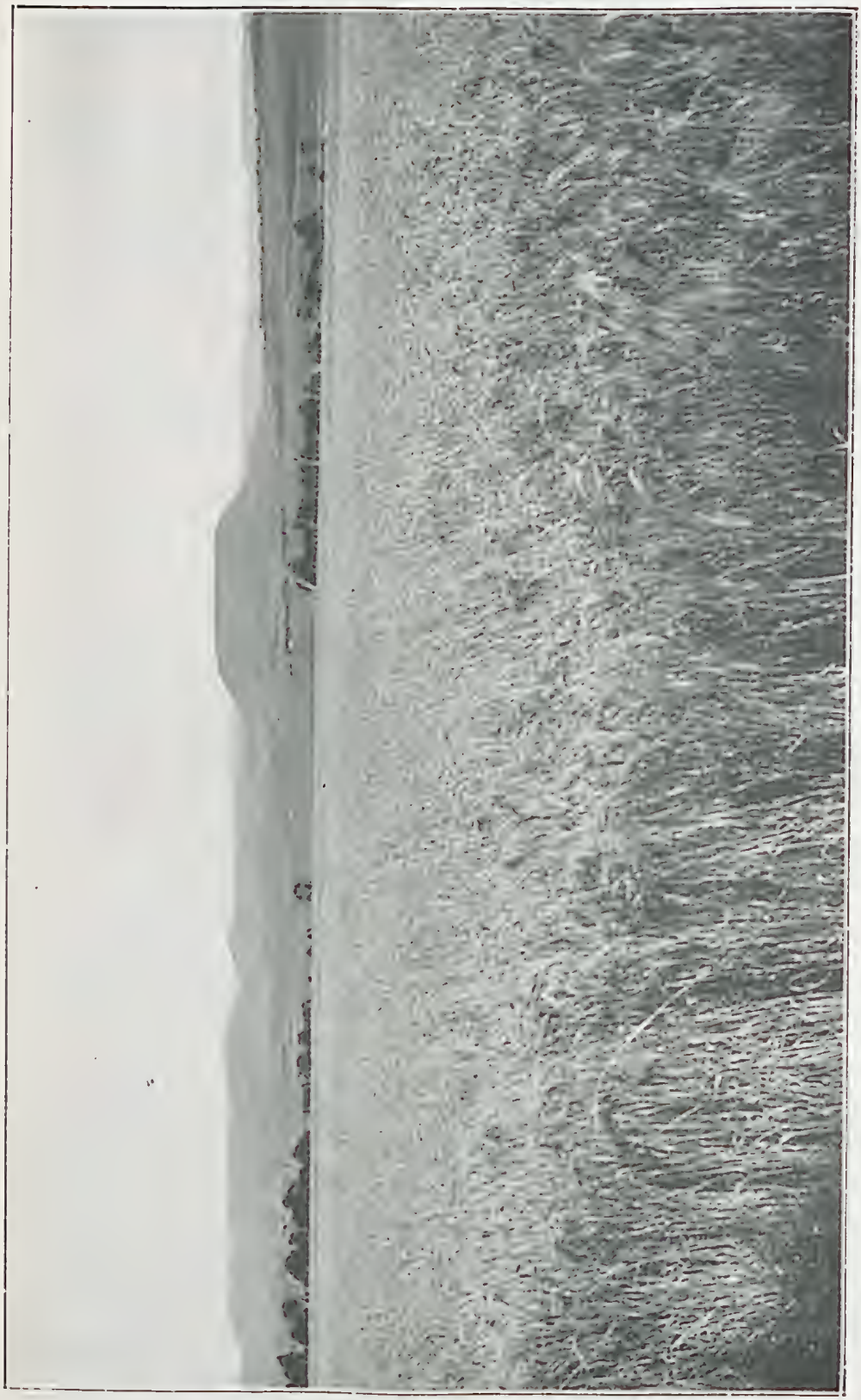


PLATE 15.—A FIELD OF CCC 3 WHEAT EXPERIMENTAL FIELDS-LE PLOT ON THE PROPERTY OF MR. E. M. LAESS, CAMPBELLS PLAINS, WARWICK DISTRICT.

It was noted where the cane was most diseased the soil was in very bad physical condition. Cane varieties doing well in this district are Q. 813, H.Q. 285, Q. 1121, and D. 1135.

Growers are advised to make full use of the information that can be obtained from the Mackay Experiment Station on fertilising, and to make local experiments of their own.

St. Helens.

Rapid progress is being made with land settlement and growers this season have forwarded a quantity of well grown cane to the mill. Most of the land under crop at present is a good quality forest loam, although a considerable area of scrub land has been cleared and planted. Cane varieties doing well are M. 1900 Seedling, H.Q. 285, Pompey, H.Q. 426, and Badila. The last named is making a good showing on the scrub lands. At present there are very few recommendations that could be made for soil improvement, but farmers are advised not to fall into the common error of people who start farming on new land, that is, exhausting the natural fertility of the soil before they start green manuring and fertilising. The soil in this area is at present fertile and in good physical condition and the farmers, especially those on the forest land, are advised to green manure as each block of land becomes available after ploughing out.

St. Helens district is admirably suited for closer settlement, being well watered, with good pasture land, and the main trunk railway running through the agricultural land.

Bundaberg District.

The major diseases are mosaic, leaf stripe, and "gumming." The former is by far the most prevalent, and the following figures will illustrate the loss in weight a farmer incurs through this infection:—

FIRST TEST—FIRST RATOONS.

Healthy.	*Diseased.*
Variety: D. 1135.	Variety: D. 1135.
Length: 1 foot (from ground).	Length: 1 foot (from ground).
Age: 6 months.	Age: 6 months.
Weight: 14½ ounces.	Weight: 8½ ounces.

SECOND TEST—PLANT CANE.

Healthy.	*Diseased.*
Variety: Black Innes.	Variety: Black Innes.
Length: Whole of stick.	Length: Whole of stick.
Age: 12 months.	Age: 12 months.
Weight: 6¾ pounds.	Weight: 4¼ pounds.

THIRD TEST—PLANT STANDOVER.

Healthy.	*Diseased.*
Variety: H.Q. 77.	Variety: H.Q. 77.
Length: 1 foot.	Length: 1 foot.
Age: Undetermined.	Age: Undetermined.
Weight of 1 foot taken from cabbage downward: 12 ounces.	Weight of 1 foot taken from cabbage downward: 8 ounces.

Comparative analyses show very little effect on the percentage of c.c.s. in the cane; the loss is mostly in weight of cane and sugar.

The growers can see from these figures how necessary it is to be careful when planting.

There is an important matter with regard to maize planting in the Bundaberg district to which it is necessary to draw the farmers' attention, that is, the likelihood of Mosaic disease in this plant.

Mottling or striping of leaves and dwarfing of the plants are mostly always symptoms of Mosaic in corn. The corn aphid (*Aphis maidis*) is a known transmitter of Mosaic disease.

Summarising the above, the growers are recommended to—(1) Make a careful survey of cane for plants; (2) stop growing corn or sorghum close to cane; and (3) plough in as much trash and vegetable matter as possible, but allow it to rot well before planting.

QUEENSLAND SHOW DATES FOR 1925.

Feb. 4–6 —Stanthorpe Agricultural Society (A. E. Bateman, Secretary).
10–12—Eastern Downs H. and A. Association, Warwick (H. Sterne, Secretary).
18–19—Central Downs A. and H. Association, Allora (H. G. Deacon, Secretary).
25–26—Darling Downs P., A. and I. Association, Clifton (P. G. A. Murphy, Secretary).

March 11—Oakey A. and P. Society (H. M. Rutledge, Secretary).
19—Goombungee and Haden A., H. and P. Society (J. J. Morgan, Secretary).
24–25—Inglewood A., P. and H. Society (Miss Cheshire, Secretary).

April 1–2 —Dalby P. and A. Association (C. Harvey, Secretary).
11—South Brisbane A., H. and I. Association.
13–14—Herberton M., A. and P. Association (E. C. Wright, Secretary).
15—Pittsworth P., A. and H. Association (B. Binney, Secretary).
16–17—Wondai A., P. and I. Society (G. D. Griffith, Secretary).
21—Milmerran District A., P., H. and I. Association (J. H. Sopp, Secretary).
21–22—Chinchilla A. and P. Association (J. E. Mackie, Secretary).
22–23—Killarney Agricultural Society (Clifford Alford, Secretary).
23–24—Nanango A., P. and M. Society.
28–30 –Barcoo Pastoral Society, Blackall (W. P. Tilden, Secretary).
28–30—Toowoomba Royal Agricultural Society of Queensland (G. Noble, Secretary).

May 30, 1 } Kingaroy A., P. and I. Society (J S. Michen, Secretary).
5–6 —Taroom A. and P. Association (T. O'Malley, Secretary).
6–7 —Central Warrego P. and A. Association, Charleville (W. R. Sinnott, Secretary).
6–7 —Maleny A., I., P., and R. Society (G. B. Sutton, Secretary).
6–7 —Toogoolawah D., A., and I. Association (Douglas Young, Secretary).
13–14—Maranoa P., A., and I. Association, Mitchell (W. J. Rogencamp, Secretary).
13–14—Fassifern A. and P. Association, Boonah (G. E. Ball, Secretary).
13–14—Murgon P., A., and H. Society (N. Waldock, Secretary).
20–21—Western P. and A. Association, Roma (F. W. Mills, Secretary).
20–22—Queensland P. and A. Society, Ipswich (H. W. Watson, Secretary).
26–27—Wallumbilla A. and P. Association (M. J. Grace, Secretary).
27–28—Esk P., A., and I. Association (T. C. Pryde, Secretary).

June 2–3 —Marburg and District A. and I. Association (G. E. Dance, Secretary).
3 —Brookfield, Pullen Vale, and Moggill Farmers' Association (John Phillips, Secretary).
3–4 —Logan and Albert A. and P. Society, Beaudesert (P. F. Dever, Secretary).
19–20—Lowood and Tarampa P. and A. Association (S. Coleman, Secretary).
23–27—Rockhampton Agricultaral Society (H. Hill, Secretary).

July 1–2 —Lockyer A. and I. Society, Gatton (Percy Skinner, Secretary).
2–3 —Biggenden A. and P. Society (C. J. Stephensen, Secretary).
3–4 —Sandgate A., H. and I. Association (W. F. Kenny, Secretary).
24–25—Rosewood A. and H. Association (R. J. Walsh, Secretary).
24–25—Ithaca A. and I. Asssciation (T. A. Bennion, Secretary).

Aug 6 —Humpybong A., H. and I. Society, Redcliffe (C. G. Graves, Secretary).
10–15—Royal National A. and I. Association of Queensland, Brisbane (J. Bain, Secretary).
26–27—Crow's Nest A., H. and I. Society (J. Pike, Secretary).

Sept. 24–25—A. and P. Society of Southern Queensland, Beenleigh (W. Laughlin, Secretary).
26—Rocklea A. and I. Society (C. R. Gwynne, Secretary).
26—Maroochydore Agricultural Society.

Oct. 1 —Kenilworth P., A., H. and I. Society (R. Houston, Secretary).
2–3 —Toombul A., H. and I. Association (A. J. Thompson, Secretary).
9 —Southport A., H. and I. Society (S. H. Earl, Secretary).
10—Enoggera A., H. and I. Association (N. Thomson, Secretary).

FEEDING PIGS.

WHY WE SHOULD STUDY FEEDING PROBLEMS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

To correctly understand this important aspect of pig raising, it is necessary first that we should get right down to bedrock, as it were, and to begin at the beginning by studying the objects aimed at in feeding stock. All life requires food (and also warmth and moisture) and water, whether it be the minutest form of germ or animal life or whether it be the fully developed male or female plant or animal; indeed, this is not only true of the physical, but of every other part of our bodies, and though in stock raising we aim mainly at developing the body, we also aim at the reproduction of bodies equally as well prepared as are the parents for the battle of life. We understand, therefore, that the animal body requires food to supply the material necessary for its growth. The animal stomach might, for purpose of comparison, be likened to a locomotive boiler and engine, in which both water and fire operate towards the production of the steam and power which represent the driving force. As the steam is required in considerable quantities constantly, it is necessary to continually stoke the fire, to keep the ashes and cinders well raked out and a sufficient draught of air passing under and through the fire, and to keep up the water supply in order that pressure may be retained, or as it is commonly referred to, "that there may be a sufficient 'head' of steam to do the necessary work." Thus there is not only a constant pressure or production of steam in building up, but there is also a constant waste going on in the utilisation of both the fuel and water, and these losses need to be made good by the addition of fresh supplies which must be at hand all the time. The animal body is constantly being built up as a result of the strength generated from the food, as it is absorbed in the form of "digestible nutrients" from the food stream as it passes through the stomach and bowels, and there is also a constant breaking down of tissue or waste as it has been referred to above; so it is equally necessary that fresh supplies of nutritious, succulent, and appetising food be at hand to feed the body as occasion requires.

In stock feeding, certain specific objects must be kept in view, and we must thoroughly understand each of these objectives in order to gain the maximum benefit from a study of our feeding problems.

The Objects of Feeding.

Technically speaking, the objects of feeding are—

(1) To maintain bodily heat and strength.
(2) To repair waste of tissue (muscle, flesh, fat, bone, sinew, blood, &c.).
(3) To prepare for the reproduction of young.
(4) To form new tissues and organs.
(5) To enable the animal to perform muscular labour, or to fatten in preparation for slaughter for the purpose of converting the carcase into bacon, &c.
(6) To allow of the secretion of various products, such as milk, blood, digestive juices, &c.
(7) To allow of a reserve of stores being laid by in the form of fat, &c.

To Maintain Bodily Heat and Strength.—In a normal state the bodily temperature of various animals differs somewhat, though all reach the century mark. The normal temperatures of domestic stock are as follows:—

Horse	.. .. ..	100	to	101	degrees	Fahr.
Cow	.. .. ..	101	to	102	"	"
Dog	.. .. ..	101	to	102	"	"
Pig	.. .. ..	102.6	to	103	"	"
Sheep	.. .. ..	103	to	104	"	"
Fowl	.. .. ..	105	to	107	"	"

The cat has about the same temperature as the horse. The temperature of the healthy animal body does not fluctuate, however, to more than a very slight extent. The heat required to maintain temperature is provided from the food. Thus it is important that the food supply should be of sufficiently good quality and quantity at all times.

To Repair Waste of Tissue, &c.—As with the locomotive, so with the body there is a constant wear and tear. Bodily activity involves the destruction of the various elements of which the body is composed. No sooner is this destroyed than it needs replacing, hence the food supply must not only be sufficient and of good quality, but it must be given at regular periods and in sufficient bulk to enable the digestive organs to handle it to advantage, for some bulk is necessary, though the pig does not require the same bulky food as does the cow and the horse.

It matters not whether an animal such as the horse is at regular and at hard work or is at rest, there is still a waste of tissue going on; it cannot stop, and when there is a greater supply of fuel than is actually needed at the moment the energy is produced, the balance is stored in the form of fat for future use.

Even where an animal is at rest a certain amount of energy is needed for the performance of the internal work of the body. The heart is constantly beating, the acts of inspiration and respiration keep the lungs in regular movement; these, in company with the labour involved by the action of the stomach and intestines in the process of digestion, are a constant drain on the energy thus stored. All this energy thus required and stored comes from the food.

To Prepare for the Reproduction of Young, &c.—It stands to reason that a brood sow carrying a litter of, say, a dozen young pigs, must require more food than a sow not in pig, for not only must the sow's own body be kept going, but the development of the young pigs in her breeding sac must be kept supplied. These absorb large quantities of nutrients, and this must be provided for.

Nature will even provide for their maintenance at the expense of the sow's own body if the food supply of the sow is insufficient or of poor quality. Breeding sows require abundant supplies of succulent green foods in preference to more limited supplies of concentrated food, such as maize, wheat, or barley, &c.

To Form New Tissues and Organs and to Enable the Animal to Perform Muscular Labour, &c.—It is not difficult to understand why the horse requires food when he is regularly occupied in farm or team work, or to understand why it is that an in-pig sow should have additional food, but many farmers find it difficult to realise that when the pig is fattening or even when he is growing it is performing something of the same muscular labour (though certainly the strain is not so severe) as is being performed by the horse. Here it is then that we see again the urgency of providing for an abundant supply of succulent, nutritious food of an appetising nature and sufficiently laxative in its action to keep the bowels working freely.

To Provide for the Secretion of Various Products.—The brood sow once relieved, internally, of her young pigs at birth, then takes on their feeding by way of the teat, and as young pigs usually have very vigorous appetites, the sow requires suitable milk-producing foods in liberal quantities in order to be able to secrete sufficient milk to maintain her growing litter. The milch cow, the brood mare, the lambing ewe, &c., all require similar study, nor are these the only ones, for the young pigs require careful tending even when they have reached a stage when they can be removed from the care of the sow and be weaned.

The young pigs and the pigs that are fattening in preparation for sale to the butchers and bacon curers are secreting and laying up stores both of flesh and fat. The horse stores his energy in the form of strong muscular tissue, capable of standing a heavy strain during the day's work. Animals fatten readily on good food, and the fat animal can be maintained for a long period on a much reduced ration of food.

Nor do we need to understand the objects of feeding alone; it is equally important that we understand the composition of the various constituents of the ration the pig consumes. We must also understand something of the composition of the tissues that need rebuilding.

The breaking down and the building-up processes going on in the body are frequently referred to under the term metabolism, to which further reference will be made in future articles.

CONTAGIOUS PNEUMONIA IN PIGS.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., D.V.H., Government Veterinary Surgeon, Department of Agriculture, N.S.W.*

Contagious pneumonia has caused, for the past few years, the greater part of the mortality that has occurred among young pigs In many districts it has been found on investigation that the majority of the piggeries are affected in some degree with this disease. When it is borne in mind that the condition is largely preventable, it is to be regretted that so many pig owners treat the disease lightly, and only ask for aid and advice when severe losses have occurred.

This disease is scheduled as a contagious disease under the New South Wales Stock Diseases Act, and it is incumbent upon the owner to notify the district Inspector of Stock when an outbreak occurs among his stock.

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*In "The Agricultural Gazette" of New South Wales.

Contagious pneumonia is an inflammation of the lungs due to their invasion by bacteria. A number of different organisms have been found associated with the condition, and it is not possible to state that any one bacterium is the specific cause. It is probable that bacteria normally present in the lungs are enabled to produce the disease by lowering resistance of the animal body. Although the inflammatory changes are actually due to bacterial action, numerous predisposing causes operate to lower the body resistance and enable the bacteria to exert their pathogenic effects. All these causes can be grouped under the heading of unhygienic and insanitary management, and include—

(*a*) Pig sties and yards in damp, low-lying situations;
(*b*) Inadequate housing and shelter;
(*c*) Bad flooring in the sties;
(*d*) Exposure to inclement weather;
(*e*) Muddy, undrained yards.

Symptoms.

The earliest symptoms to be noticed may not be very definite, the affected pigs being indisposed to eat and inclined to lie about in sheltered corners. Some may be heard to cough, especially if chased about the yard. If the temperature is taken it will be found to have risen to 106 degrees Fahr. or more. The following day some animals will be seen to be very ill, and, in acute cases, death may occur the same day. In most cases the course of the disease is more prolonged. Respiration becomes very rapid and shallow, a condition commonly referred to by the farmer as "pants." As the disease progresses the cough becomes more marked and a sticky discharge runs from the nose and eyes. This discharge dries and forms encrustations about the nostrils and eyes, and may partially glue the eyelids together. Meanwhile, owing to the feverish condition and lack of appetite, the pigs lose condition rapidly. The animals may die within a week to ten days of the first onset of symptoms.

Very often, associated with this pneumonia, there occurs a skin eruption. Red patches appear and later become covered with rough, dirty scabs. These scabby areas are most common about the head and back of the ears, but are also found in any part of the body.

In many cases the pigs make a partial recovery, and, with the return of appetite and the abatement of severe symptoms, may begin to regain condition. In other cases where death does not ensue, the animals remain stunted and fail to grow fat. Often such pigs are affected with nervous disorders characterised by partial paralysis and inco-ordination of movement, which result in difficulty of progression and loss of the senses of direction and balance. In cases of apparent recovery, the animals are liable to cough and show the rapid breathing characteristic of lung diseases, especially when exercised.

Pneumonia most frequently occurs in young pigs up to the age of four months. It is less common in pigs between the ages of four and seven months, and is comparatively rare in adult animals.

Post-Mortem Examination.

On opening the chest cavity of a diseased pig, the lung will often be found adhering to the chest wall owing to the inflammation of the membrane covering the lungs. Even when actual adhesion has not taken place, the surface of the lungs and the corresponding inner surface of the chest is roughened and dull in colour.

The pneumonia is usually situated in the lower anterior part of the lungs. To the feel, instead of being soft and spongy, the diseased lung is firm. On being cut, the colour is seen to vary from a dark red to a greyish colour, and may show a number of yellowish spots. Sometimes there may be a considerable area, up to a walnut or larger in size, which is filled with a dirty-looking purulent material due to the breaking down of the lung tissue.

Control Measures.

No treatment of the sick animals is recommended, since it is not profitable to try and fatten pigs that have suffered from an attack of this disease. Recovered pigs are in most cases stunted in growth, slow to fatten, and affected with nervous disorders which prevent the animals from putting on condition. From an economic point of view it is better to destroy the affected pigs at once.

Prevention.—The following preventive measures are recommended:—

(*a*) All apparently healthy pigs should be removed at once from those showing signs of pneumonia.

(*b*) All sick pigs should be destroyed and the bodies burned.

(*c*) If the sties which housed the sick pigs are not of solid construction they should be burned where they stand. The yards should be dug up or ploughed and treated with lime and a greep crop sown. Where the sties are well built and too valuable to be burned, they should be thoroughly disinfected by scorching all over with a brazing lamp, or thoroughly washed with a 5 per cent. solution of disinfectant. The floors should be well scalded with boiling water and then treated with quick lime. Wooden feeding troughs should be burned. Concrete and iron troughs should be well disinfected with a 2 per cent. solution of washing soda in boiling water.

(*d*) Where practicable, a new piggery should be erected on a fresh site and care taken that only healthy pigs are introduced.

(*e*) All newly-purchased pigs should be isolated for a period of three weeks before being placed in the general piggery. All pigs noticed to cough frequently should be kept isolated and sold for slaughter as soon as fat.

(*f*) Care should be taken that the pig run is dry and well drained in wet weather. The pig sties should be warm and dry and free from draughts. The floor should be raised above the ground level, and if of concrete or brick, a wooden sleeping platform should be provided.

THE BERKSHIRE BREED.

SOME INTERESTING LITTER RECORDS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The statement that "Berkshires do not farrow enough pigs," a statement that has been often made in Queensland, in the other States, and abroad, has recently been challenged by the Berkshire breeders of America through their secretary, E. M. Christen, an authority on the breed, and an official who has done a great deal of research work over a long series of years.

When asked why this statement had been made, on the occasion of a chat to a prominent Berkshire breeder recently, the answer was short and not altogether satisfactory for, said the breeder referred to, "I don't know, but that is what people tell me." Now many pig breeders in the Northern State have said the same thing to the writer in the course of the past twelve months, and there seems to be a general impression that the Berkshire is not as prolific as it ought to be.

Observation had, however, taught Secretary Christen that these remarks were not true, because he had seen as many "producing" Berkshires as any other breed in the course of a five years' special study of this type. The ability of the Berkshire sow to produce a sufficient number of pigs was unquestioned in his mind. "Now," said he, "what was the evidence which could be presented to even a biased mind, which would convince him that average Berkshire sows not only farrow as many pigs as any other breed but that they also rear as many?"

So attention has been turned to the records as contained in the first 1,400 litters recorded in volume 63 of the "American Berkshire Record." This survey brought the data strictly up to date, as the 1,400th litter was entered on 2nd July, 1924. This record of 1,400 litters does not include duplicates such as litter mates. The 1,400 litters showed a total of 12,309 pigs farrowed, or an average of 8.792 pigs to the litter. This is as good or better than the other breeds do, and considerably better than averages on farms where purbreds only are used.

Of the 12,309 pigs farrowed in these 1,400 litters, 9,803 of them were reared. This makes an average of 7.002 pigs reared per litter, which is well within the probabilities of a net return from the brood sow even now.

When one considers that these litters were farrowed and the records came from every State of the Union, from every age of sow, farrowed in every season of the year, and under every condition, we can accept them as authentic and without hesitation. One of the tasks of Berkshire breeders is to see that this information passes into the hands of men who do not know about the breed.

A Berkshire sow, or any sow to be profitable, must farrow a reasonable sized litter, and then rear them. It is true many pigs are lost before weaning time because of carelessness of the owner, improper management, or wrong feeding. The sow is nearly always charged with this loss, whether it is her fault or not, especially by the sceptic who does not know, nor desire, to find the truth. Breeders must present facts to counteract this.

At the same time we must not bind ourselves to the fact that certain sows or certain families do not produce as large litters as others. When such an animal is found the sow should be sold for pork. It is reasonable to expect the pigs in a small litter to be plumper and more attractive looking than those in litters of seven, eight, or ten. They ought to be, but there is no reason why they should be retained on the

farm. The breeder must ask himself, and answer the question—"If the sow or boar in the big litter had had the same chance, would she or he be as good as the pig before us from a small litter?"

This has not been done in the past, and our selection of breeders has been largely a selection without respect to breeding, ancestry, or the chance the pig has actually had. Many simply select the best looking pigs. This is shown by the fact that practically every pig in litters of three, four, or five were all reared and (in the case of the American Herd Book referred to) were all registered, while it was seldom that more than four pigs were ever registered from a large litter.

It was also noticed that the litters in some herds ran uniformly large in size, while in others they were uniformly small. This goes to show that selection or care, or both, affect the number of pigs farrowed and reared.

A summary of the 1,400 litters mentioned above shows—

9	Litters	of	3	pigs	each
19	"	"	4	"	"
46	"	"	5	"	"
99	"	"	6	"	"
177	"	"	7	"	"
282	"	"	8	"	"
294	"	"	9	"	"
215	"	"	10	"	"
130	"	"	11	"	"
61	"	"	12	"	"
42	"	"	13	"	"
12	"	"	14	"	"
11	"	"	15	"	"
2	"	"	16	"	"
1	"	"	17	"	"

Total 1,400 with a total of 12,309 pigs farrowed and an average of 8.792 pigs to the litter.

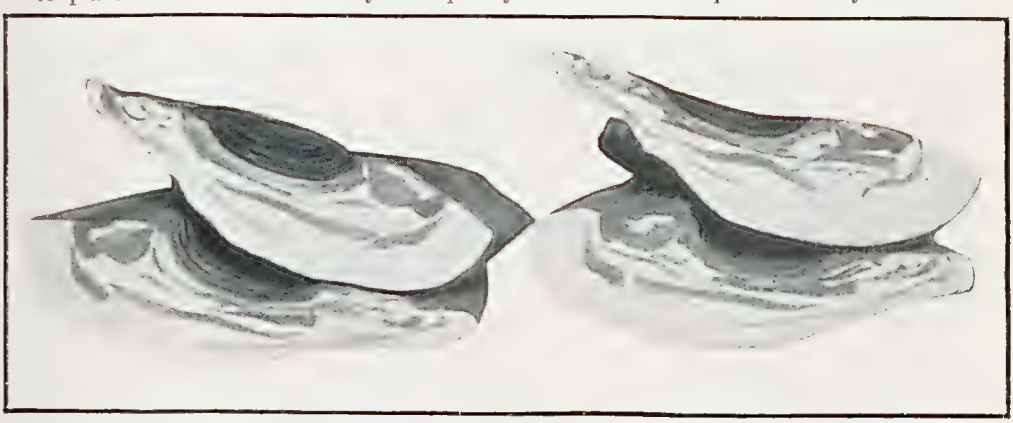
In conclusion, we can say, and should say, that Berkshires are prolific and use the above-quoted authentic figures to show it. Also, that these Berkshire sows are good mothers, as they reared over seven pigs to the litter, or, to be exact, 9,803 pigs in the 1,400 litters. These figures come without any omissions, with no effort to find a favourable record, but as a clean, short presentation as to what an average Berkshire sow will do and can be expected to do.

It is unfortunate that up to the present our Australian Stud Pig Herd Books have kept no record of the litters produced by the sows whose breeding has been recorded in these stud records.

Now, however, that it has become necessary for breeders to notify the secretary of the society in the State in which they reside as to the farrowing records of the stud sows and to give exact records as to the sale, transfer, and death of any stud animal registered in the herd book, it will be possible for Australian breeders to emulate the example set by Secretary Christen and investigate the position to ascertain whether our Berkshire and other breeding sows are as productive and as profitable as they ought to be.

QUEENSLAND BACON AND HAM.

The accompanying illustrations indicate that Queensland bacon curers are able to place on the market a very fine quality bacon and ham provided they have the



FIRST PRIZE SIDE BACON. SECOND PRIZE SIDE BACON

PLATE 16.—BRISBANE EXHIBITION, 1924.

correct class of pigs to "work on" in the first instance and have all the necessary conveniences for curing.

These illustrations depict bacon and ham from pigs of the Berkshire-Tamworth cross. They were the progeny of a pure bred Berkshire boar mated with a Tamworth-Berkshire sow, were five months and one week old when slaughtered, and weighed 112 lb. dressed weight. They were of the age, weight, and quality most in demand by the bacon factories.

Pig raisers generally would do well to note the very even distribution of lean meat (commonly by the trade referred to as the "marbling") throughout the fat on these cuts of bacon and ham, and to remember that in general the consuming public will not pay satisfactory prices for heavy fat bacon; they much prefer, and will pay top rates only for fleshy, fine quality meat, such as is obtained from bacon pigs from five and a-half to six and a-half months old, weighing from 100 to 120 lb.

PLATE 17.—SECOND PRIZE HAM, BRISBANE EXHIBITION, 1924.

dressed weight. Pigs of the correct type, quality, and weight are always in strong demand, and this particular cross is one that may be recommended for use generally throughout this State. The illustrations are of the first and second prize bacon and of the second prize ham at the last Brisbane Show.—E. J. SHELTON, Instructor in Pig Raising.

A MOVABLE PIG HURDLE.

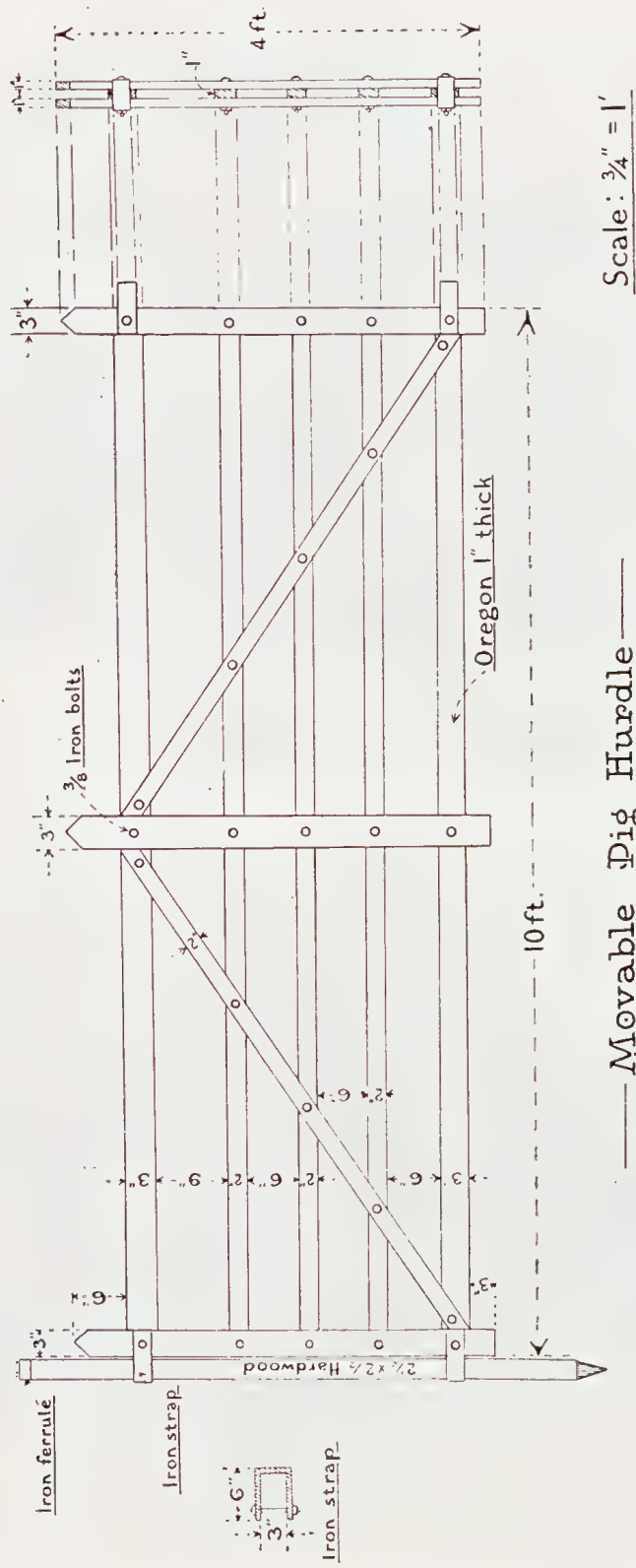
The accompanying drawing is of a movable hurdle for use in connection with the feeding off of farm crops by pigs. The hurdle is 10 ft. long and 4 ft. high, and is constructed of Oregon or other soft wood battens 3 in. by 1 in. and 2 in. by 1 in.

In erecting the hurdles, sharp-pointed stakes are used with an iron ferrule at the top (to prevent the stake splitting when being driven into the ground). These stakes are of 2½ in. by 2½ in. hardwood and are either 5 ft. or 5 ft. 6 in. long. They are placed in position through the iron straps when the connecting hurdle is in position and are then driven into the ground so as to hold the fence firm. Hurdles of this description, if properly constructed and carefully handled have a very long life, and can be used to considerable advantage on mixed farms where crops are grown for the stock, either as a temporary ring fence or as a subdivision fence, if portion only of the crop was being fed off.

The drawing gives all the details necessary for construction, and any timber merchant or carpenter would quote for making up a set of these hurdles if the farmer was not in a position to do the work. It should be noted that the iron strap referred to should be made sufficiently large to allow the pointed stake to slide up and down freely when being placed in position, prior to being driven into the ground, and a wooden maul should be used in preference to "the back of the axe," so that the stake will not be splintered.

The drawing was originally prepared by Mr. F. Bostock, of the Hawkesbury Agricultural College, Richmond, N.S.W., where, during the writer's term as Pig and Bacon Expert, numerous crops were fed off by the pigs, particularly during the autumn and winter seasons.

The open-air paddock system of pig feeding has much to recommend it, and the secret of success in pig farming will be found to lie chiefly in the provision of suitable farm-grown crops, for the pig has a big appetite, and best results will accrue only where the pigs are liberally fed and carefully handled.—E. J. SHELTON, Instructor in Pig Raising.



Movable Pig Hurdle

A NEGLECTED INDUSTRY.

The demand for the product, the prices obtained for it, and the disparity between the amount grown locally and the amount consumed, all constitute reasons why the acreage of asparagus should be substantially increased. So far it has been found that the whole of the crop marketed can be disposed of in its fresh state. There are decided possibilities, on the other hand, in the production of asparagus for canning. Practically the whole of the canned asparagus on the Australian market is imported, and the quantity is tending to increase. About 100,000 cases, each containing two dozen tins, are imported annually. The duty amounts to 8s. 6d. per dozen large tins. Reference to the wholesale prices as published certainly suggests canned asparagus as a proposition into which local growers and manufacturers might advantageously inquire.—A. J. PINN, Special Agricultural Instructor in the "Agriculture Gazette" of New South Wales.

PIG BREEDING—A STRIKING CONTRAST.

The illustration herewith (Figs. 1 and 2) are of two boar pigs. Fig. 1 represents the wild or bush pig at one time common, but now fast disappearing in Queensland and in North-western New South Wales. He is a descendent of a strain—probably Berkshire—introduced into Australia in the early days of settlement here, but having escaped into the bush has reverted to the type of a century ago. This pig is in prime condition, too, for he had been trapped whilst young and had been fed liberally on nourishing foods for many months in an attempt to fatten him so as to have him on exhibition at one of the Northern Shows.

His weight when over two years old was less than a prime bacon pig of these days at six months of age. His type is a decadent one; he is coarse and inferior in every respect; note the shape of his ham and the poor quality body development. There is but one profitable way of disposing of these wild pigs, and that is, either by poisoning or hunting and shooting to rid the country of them.

Fig. 2, on the other hand, illustrates the modern type of Berkshire. He is a stud sire at the State Farm, Warren, *viâ* Rockhampton, Queensland, and his official weight, record, and pedigree have been certified to by the manager of Warren State Farm, Mr. W. H. Bechtel.

The details are as follows:—Name, Berkshire boar, "Warren Chief" 3966; farrowed 6th August, 1921; sire, "Conargo Invincible" 2150; dam, "Bessie of Warren" 2656. Bred at State Farm, Warren.

Weight	when	72	days	old,	59½ lb.
"	"	79	"	"	67¼ "
"	"	86	"	"	80½ "
"	"	93	"	"	87½ "
"	"	100	"	"	101 "
"	"	107	"	"	108 "
"	"	114	"	"	120 "

Maximum weight gained per seven days, 13½ lb. Total average gain, over 1 lb. per day from birth till 114 days old.

This boar is in striking contract to the boar illustrated in Fig. 1. The modern Berkshire possesses the advantages of easy feeding qualities, rapid growth, trueness to type and standard, and early maturity.

The photographs were supplied by the manager of the Warren State Farm, who remarked that the wild boar (Fig. 1) had been trapped and specially fed for the purpose of demonstrating that it is useless attempting to handle these pigs on a commercial basis; they will neither develop nor fatten to advantage and the feed given to them represents so much waste, while if well bred typical Berkshires are kept it is not asking too much to expect them to increase in weight at the rate of 1 lb. per day from birth to maturity. Young pigs whilst suckling will not, of course, develop as rapidly as they will do when they have passed the weaning stage, but during these early days it is not unusual for suckers to increase in weight at the rate of ½ lb. per day, and to put on as much as 1½ lb. or more per day during the period from four to six months of age. The medium weight bacon pig so much in demand in these days—viz., a pig weighing from 100 to 120 lb. dressed weight—can readily be produced in six months provided the right class of pig is bred.—E. J. SHELTON, H.D.A., Instructor in Pig Raising.

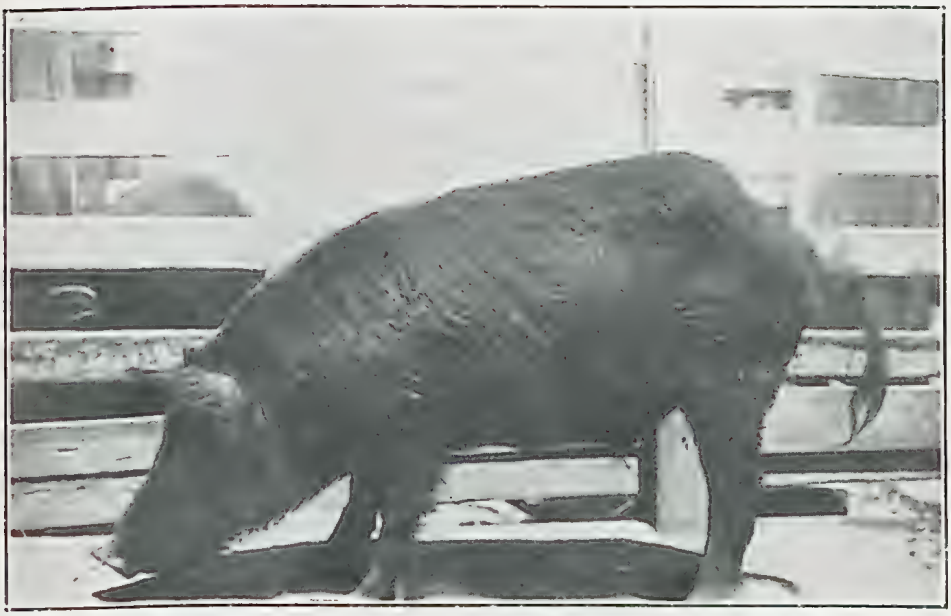


PLATE 18.—THE WILD, OR BUSH, PIG—A DESCENDANT OF A STRAIN, PROBABLY BERKSHIRE, INTRODUCED INTO AUSTRALIA IN THE EARLY DAYS OF SETTLEMENT.

PLATE 19.—A MODERN TYPE OF BERKSHIRE, "WARREN CHIEF," STUD SIRE AT THE STATE FARM, WARREN, QUEENSLAND.

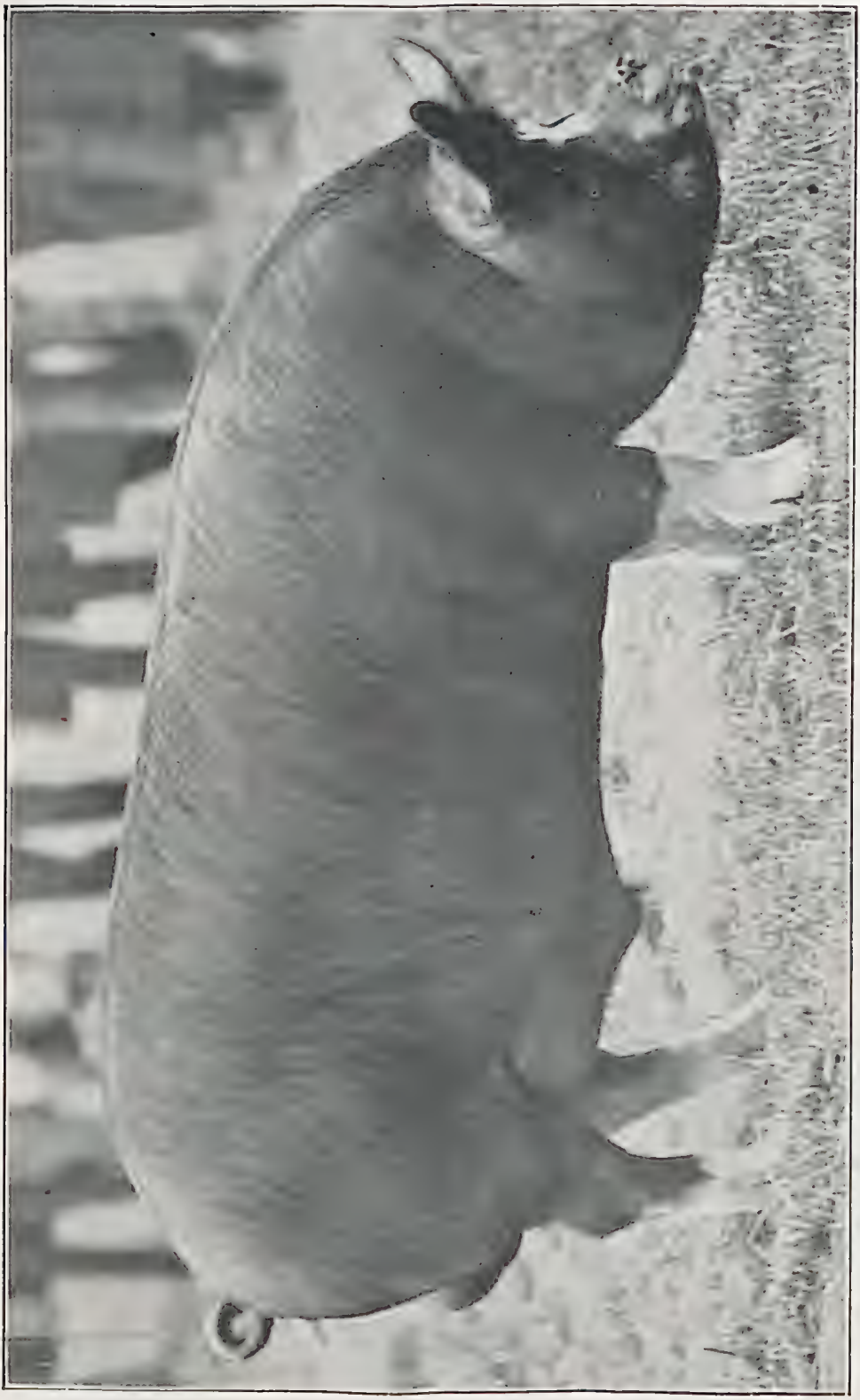


PLATE 20.—A PROMINENT PRIZE-WINNING BERKSHIRE BOAR AT ENGLISH SHOWS, "HIGHFIELD ROYAL PYGARATION 3RD," WINNER OF FIRST PRIZE, ROYAL AGRICULTURAL SOCIETY'S SHOW, ENGLAND, 1924.

Note the even, well developed, lengthy body, the neat attractive colour markings characteristic of the Berkshire breed, and the superior

PLATE 21. ANOTHER LEADING PRIZE-WINNER AT ENGLISH SHOWS. "RICHING'S BEAUTY 1ST." FIRST PRIZE AND CHAMPION SOW, R.A.S. OF ENGLAND, 1924; FIRST PRIZE AND CHAMPION SOW, BATH AND WEST SHOW, 1924; AND FIRST PRIZE AND RESERVE CHAMPION, ROYAL COUNTIES SHOW, 1924.

A remarkably well-developed, long and deep bodied attractive animal. Berkshire sows of this quality are of increasing value. They play a prominent part in the production of better Berkshires and should be the ideal of every Berkshire breeder.

REPAIRING CONCRETE WALLS.

Usually when the inside of a concrete or other masonry silo is plastered the walls are not yet rigid. Subsequent checking and cracking often follow, and the owner wonders why, yet fails to take the time to repair them. Surface checks usually do no harm, and are often the result of excessive strain on the surface when the water evaporates. But if the checks are cracks and extend through the wall, they should be repaired. Pure cement wash is perhaps as good as anything. But to make the wash bond perfectly with the old concrete, the surface should be

soaked with water for several minutes before the wash is applied. The wash should be of the consistency of thick cream first, then thickened until it will just pour. Large cracks which may require a flexible joint are repaired by heating with a blowtorch until the surrounding surface is warm. Asphalt-soaked rags are then tamped in with a hammer and a hardwood stick, and then covered with pure asphalt or heavy tar. These hints will apply also to cisterns or water tanks.—"Country Gentleman."

WEEDS OF QUEENSLAND.

No. 37.

By C. T. WHITE, F.L.S., Government Botanist.

DEVIL'S CLAW (*Martynia lutea.*)

Description.—A rank growing weed with a rather foetid smell, stems and leaves with short hairs clammy to the touch; stems and leaf stalks hollow; leaves large (pumpkin like), round, broader than long, 8 inches or more across, on stalks slightly longer than the breadth of the leaf; flowers in crowded racemes at the end of a long stalk; corolla deep yellow, 1¼ inches across, the throat mouth and lower lobe of the corolla dotted and streaked with reddish and purplish spots and short lines. Seed-capsule about 6 inches long ending in a long curved beak, the outer green covering disappearing and leaving a dry, hard, woody seed vessel covered with sharp prickles and opening in two valves, each valve ending in a long curved hook.

Distribution.—A native of South America. First recorded as a naturalised alien in Queensland; it is now very common on some parts of the Darling Downs, particularly in the Dalby district.

Common Names.—Most commonly known in Queensland as Devil's Claw. Other popular names for it are Unicorn Plant, Elephant's Trunk, Devil's Claw, Devil's Grip, Ram's Horn, Eagle's Claw, and Double Claw. It also often goes under the name of "Pumpkin Vine" from the pumpkin-like growth of the plants.

Botanical Name.—*Martynia*, after John Martyn, an early professor of botany at Cambridge University, England; *lutea*, Latin, meaning yellow in reference to the yellow flowers.

Properties.—The spiny, clawed seed vessels become entangled round the hocks of horses and cattle, and in this way the plant is spread from one district to another. The seed vessels often become entangled in the thick wool of sheep, particularly under the neck, and their presence may not be discovered until shearing time with consequent breakages to the teeth of the shears. The weed is also naturalised in New South Wales, and W. F. Blakely, writing in the "Agricultural Gazette" of New South Wales (vol. 34, p. 579, 1923), states that men employed in cutting the plant become dizzy after working on it for any length of time. The plant apparently is left quite untouched by stock.

Eradication.—The weed is, fortunately, not very difficult to eradicate, and the usual method of hoe-cutting below the soil level is the most satisfactory one; as the plant is an annual, this should be done prior to the seeding stage.

Botanical Reference.—*Martynia lutea*, Lindley, in Botanical Register Tab. 934.

PLATE 22.—DEVIL'S CLAW (*Martynia lutea*).

General Notes.

The Price of Australian Wool.

The Bradford "Wool Record" gives a long list of comparisons between prices for well-known clips attained in Australia and those which the same wool realised in London. The following are one or two prices picked out at random, and should cause sheepmasters furiously to think:—Scoured: Bundoran, A hoggets', Australian price 60d., London price 68½d.; J.B.H. / Alberto Downs, AAA E. and W., 59¾d., 71d. Greasy: Ware (conjoined), ex super. combing, 44¾d., 55d.; Hawker / Bungaree, AA rams', 26¾d., 32½d.; C & T / Barealdine, A pieces E., 27¾d., 33½d.; Mawallok, broken fleece, 33d., 45d.; Melville Forest, broken fleece, 33¾d., 45d. The comment of the journal in question is that as long as growers are satisfied to sell on the spot nobody need complain.

Egg Boards in Ancient Days.

Getting off the beaten literary track in the course of holiday reading, one would think that a volume on new archeological discoveries would be about the last place in which to find a suggestion of present-day marketing problems. That human nature has changed very little, if at all, down the ages is evident from a study of Greek and Coptic papyri ("The New Archeological Discoveries"—Camden M. Cobern, D.D., Litt. D.), in the course of which we find that "corporations and even individuals were, about the era of St. Paul, found engaged in business plans which seem strikingly up to date. For example, the egg-seller (A.D. 32-37) finds himself under oath not to sell eggs privately at a discount, but only in the public market at a fixed price." Evidently, the egg boards and committees of direction, even in those far-off days, had their little troubles with the non-co-operating producer.

The Romance of the Soil.

How many farmers know anything about the remarkable structure of the soil they till, of its fascinating history, of the teeming population of living organisms that dwell in its dark recesses? How many know of the wonderful wheel of life in which the plant takes up simple substances and in some mysterious way fashions them into foods for men and animals and packs them with energy drawn out of the sunlight—energy which enables us to move and work, to drive engines, motor cars, and all the other complex agencies of modern civilisation? No one knows much of these things, but if we knew more, and could tell it as it deserves to be told, we should have a story that would make the wildest romance of human imagination seem dull by comparison, and would dispel for ever the illusion that the country is a dull place to live in. Agricultural science must be judged not only by its material achievements, but also by its success in revealing to the countryman something of the wonder and the mystery of the great open spaces in which he dwells.—Sir JOHN RUSSELL, Director of Rothamsted Agricultural Experiment Station.

New Acalyphas.

Mr. George Johnson, who for many years was curator of the Charters Towers Park, and a gardener of much experience and knowledge, has made a special study of acalyphas. By long and careful experiment he has produced twenty new varieties. By hybridisation no fewer than 600 new varieties were produced, but only twenty were kept, the others, not being considered sufficiently decorative, were discarded. The new varieties are nearly all heavily serrated on the edgings of the leaves. The leaves are curled and crimped, and in some cases the crimpings are a deep pink; the result is a delightful head of magnificently shaded foliage. Dominating colours of green and white, to very dark reds, and many intermediate shades of salmon, pink, yellow, and one a metallic bronze with a wonderful edging of serration on its leaves are characteristics. The leaves are beautifully shaded and tinted. These new acalyphas, being vigorous growers, will be welcomed by all gardeners, so magnificently decorative are they.

The acalypha is a native of North Queensland rain forests, and in its native state is almost green; and it is most interesting to note the splendid results in improved colouring and size of leaf, and wealth of foliage secured by Mr. Johnson.—Townsville "Daily Bulletin."

Canary Seed Board.

As the ballot recently held in connection with the proposed Canary Seed Board resulted in favour of the constitution of a board, the necessary Order in Council has now been approved constituting a board to deal with canary seed harvested in Queensland during the season 1924-1925 (1st March, 1924, to 28th February, 1925). The board will consist of three growers' representatives and one representative of the Council of Agriculture, and will hold office for twelve months from the date of election.

Dairy Export Control—The Voting.

The complete results of the poll of producers in connection with the Dairy Export Control Act have been announced. In every State except Queensland there was an overwhelming majority in favour of the Act, which will accordingly be put into force.

The voting in each State was as follows:—

	N.S.W.	Vic.	Qld.	S.A.	Tas.	W.A.	Total.
Votes on roll	19,009	51,700	15,238	22,000	4,232	3,000	115,179
In favour of Act ..	4,587	8,330	2,982	1,244	485	342	17,970
Against Act	863	851	3,346	390	73	4	5,527

Spraying Grasshoppers.

In view of recent reports of the appearance of grasshoppers in parts of New South Wales, the instructions of the Government Entomologist of that State are of interest. He says that their eggs, which will have been laid in definite patches, will not hatch out until about September next, and unless a very wet or cold winter is experienced in the affected districts it would be well for graziers and farmers to watch where the eggs are laid, mark such patches, and to take up spraying of the young hoppers, if they hatch next spring. The formula recommended is 1 lb. arsenite of soda, 4 lb. treacle, and 16 gallons of water sprayed direct on to the young hoppers, and on to the adjacent grass. This will destroy them, both by contact and by poisoning their food.

What Farming Means.

Thus Councillor Higman, of Coolamon, New South Wales, in "The Land." "It was immaterial how successful he was, the farmer rarely, if ever, expended it upon himself and upon the gratification of his desires. He put that wealth back into the soil which had given it to him in order that it might return more wealth to posterity. He had been tempted at one time to relinquish farming and invest in property in the city, and perhaps from that investment he would have accumulated more monetary wealth than had been his portion by remaining on the land. He had never regretted his decision. The farmer in his wheat culture was growing more than grain. They were producing men and women. Most of the greatest men of history had been products of the soil, and this in spite of the advantages of education and opportunity presented by the city and city environment."

Fertilisers Acts—New Regulations.

New regulations under the Fertilisers Acts have been issued and all previous regulations cancelled. Among other matters it is to be noted that every dealer in fertilisers is required to obtain a license, the fee for which is £1 1s.

The new regulations prescribe fees for the analyses of samples for dealers, and in the case of buyers other than dealers a reduced fee is prescribed.

Before selling any fertiliser every dealer is required to fill in and forward to the Department of Agriculture, Brisbane, a certificate in the form of Schedule A of the regulations, setting out the name of the fertiliser and the percentage of nitrogen, phosphoric acid, and potash, and the respective forms in which they occur, and in the case of lime for fertilising purposes the percentage of lime, carbonate, &c.

In addition to Schedule A every wholesale dealer or producer of fertilisers is required to fill in Schedule B, setting out the name and address of the manufacturer, the raw materials from which the fertiliser is produced, the percentage by weight of each of such raw materials, and in the case of organic material the treatment, if any, that such organic material has been subjected to.

Every wholesale dealer or producer of fertiliser is also required to forward a specimen of the printed label used for each registered fertiliser, and to durably brand or stamp each package of fertiliser with a brand distinguishing and identifying all fertilisers sold by him or under his name.

A penalty of £20 is provided for any contravention of the regulations.

Milking Machine Teat Cups.

Milking machines have now been in practical and successful operation a long time. Many improvements have been made, and milking machines are now considered a success, providing they are used on cows suitable for machine milking and that they are operated by a person who understands the cows and the machines, and knows how to intelligently co-ordinate them. Milking machines must be kept sanitary, and the plant must be kept in good mechanical order. When these points are observed, milking machines will perform a final service for the dairy farmer who keeps at least ten or fifteen cows in milk all the time.

Within a certain range, no one type of teatcup can be said to be the best. If everything is right and the plain cups are of the right size, and the cow is not too hard a milker, equally good results will probably be obtained with the plain cups as with the rubber lined. Under all conditions, the rubber lined teat cups will give better average results than will the plain cups. Plain cups will do as good work under ideal conditions, but the rubber lined cups will do better average work under all conditions. Mechanically speaking, there is more action to the rubber line cups than there is to the plain ones. This action on the side and end of the teats is so co-ordinated with the needs for milking that it gives the rubber lined cups some advantage.

This statement is made on the assumption that the rubber lined cups are properly constructed in the first place; that there are no leaks in the rubber lining; that it is kept sanitary, and that the pulsator is properly set or adjusted in the machine wherever adjustment can be made. If there should be a leak in the rubber lined cups, if the inner rubber be old, hard, and cracked, and if the pulsator does not work properly, the rubber lining may become an actual damage to a milking machine; and under such circumstances a plain cup of the proper size and properly fitted to the cows will undoubtedly be better.—"Hoard's Dairyman."

The Bribie State Nursery

The general conditions surrounding Bribie State Nursery are not such as would appeal to the average horticulturist, the area being practically made up of fine sand.

Just what can be accomplished is now evidenced in an abundant crop over the cultivated area of Mauritius bean for building up and improving the soil generally. It will be admitted that the situation is not suitable for all classes of plants, but a bush house, 250 yards by 50, when completed will allow for starting all plants under suitable conditions and watered by spray irrigation.

The latest addition is a large quantity of strawberry seed introduced with a view to improving existing varieties. Within a month of planting the seeds the young plants are ready to lift from seed-beds and replant for further development.

A number of Avocado pears was imported from Florida, also several of the best varieties of Pecan nuts, both of which have made particularly good headway. Seedling plants have been raised from seeds, and a number of these are now available for distribution, also plants of the soft-shelled Macadamia (Queensland nut).

The production of banana plants free from disease has received principal consideration. The original corms are discarded except for a small portion attached to the eye or bud removed for germination which is effected under shade, the young plants being removed later and planted in open rows. Upwards of 10,000 strong, healthy plants are now ready for sale and distribution.

With a view to improving the general type of smooth-leaf pineapples, a collection of gill sprouts from selected plants of special merit has been included, and the advantages of paper mulch in pineapple cultivation are very forcibly demonstrated.

A liberal supply of well water is obtained at a shallow depth—16 ft. A windmill gives the necessary power to maintain a sufficient supply in a storage tank. In addition, two spear pumps are in use.

The establishment of a nursery of this nature is naturally rather a slow process, but the progress made up to the present is very creditable to the manager, Mr. Jas. Mitchell.

During the warmer months of the year is considered the most favourable period for the removal of tropical plants, and the present time is opportune for bananas, Avocados, and Macadamia, the two latter being pot-grown. The planting of Pecan nut should be deferred until winter.

Applications for plants should be made to the Under Secretary, Department of Agriculture and Stock, from whom information as to prices and other conditions may be obtained.

Slaughtering Regulation Altered.

Regulation 3 of Part I. of the Regulations recently issued under the Slaughtering Act has been altered to read "district within which a slaughter-house is or is proposed to be established" instead of "district within which a slaughter-house is proposed to be established."

Selecting a Dairy Cow.

In a commercial sense the dairy cow is a machine for the production of milk and butter-fat and the reproduction of other machines of her kind and purpose. Her value depends primarily upon the quantity and quality of her product, whether this be milk or her own offspring, and her ability to maintain both her productive and reproductive ability for extended periods.

Certain characteristics are essential, without any one of which she will not be able to function profitably. These characteristics are five in number, says "Dairying in Kansas" (Kansas State Board of Agriculture), and include constitution capacity, nervous temperament, blood circulation, and ability. These have to do not only with the machinery of production and reproduction, but with the endurance and functioning of that machinery. Continued production is just as essential as volume.

So vitally important are these five characteristics that it is practically impossible to demonstrate that any one of them is most essential. They must all be present in their proper development or the machine is unequal to the task of profitable production. The choice of a particular breed is of secondary consideration, to be determined by the personal preference of the dairyman. The essential characteristics are possessed by all of the recognised breeds of dairy cattle and by no one more than any other. They have been necessary factors in creating and maintaining each of the several breeds.

The successful dairyman must know these characteristics and their relation to each other, as well as their individual importance. A free production of milk of good fat content must not be the basis of valuation until it is known that this is persistent in the annual milking period and likely to be during the lifetime of the animal.

In judging a cow to determine whether she will meet the requirements of the dairyman, it is always wise first to view her from the side and while she is in motion. This should be followed by a more detailed examination. The efficiency of the cow as a milk-producing machine is determined at the pail. To be able to produce satisfactory quantity and quality of milk a cow must have capacity, but if she is to continue this throughout her lifetime she must be possessed of a vigorous condition and abundant vitality.

Constitution in a cow is shown by a number of things, among which a large breathing capacity may be placed first. Since oxygen is essential to the proper purification of the blood, a large breathing capacity is an assurance of the requisite amount of air.

This is indicated by large and distended nostrils and good lung capacity. If these are small, if the nostrils are not well open, the amount of oxygen which reaches the blood through the lungs is restricted and constitutional vigour under-developed. Small nostrils may be taken as final evidence of low breathing capacity.

The vitality of the cow is shown in part by the size and capacity of the chest —that cavity of the body which contains the heart and lungs. The dairy cow should be deep, in proportion to her size, from the top of the shoulder to the floor of the chest. She should have well-sprung fore-ribs to give the vital organs ample room for development and action, but not broadened out into the wide spread of the beef animal. One authority is quoted as saying that after an inspection of fifty animals on the block, the heart and lungs of the dairy cows were found to be larger and weighed more than those of the beef-bred animals with which they were compared.

The vitality of the dairy cow is further shown in her eyes. The cow with the bright, clear, and prominent eyes gives evidence in this particular of a greater vigour than one with the dull and sunken eyes. Bull horns are not wanted in the dairy cow. The bull was originally armed for battle with rivals or for defence of the herd against enemies, and he needed horns that had the strength and size of real weapons. The cow, on the other hand, has no use for her horns in aggressive battle, but only on those rare occasions when she must defend her offspring. Her horns should be developed in proportion to her size, but they must be feminine in type and size.

A New Jersey Butter-Fat Record.

A new nine months' Jersey butter fat record for the British Empire has been established by Mr. J. Hatchinson's Babs of Somerville, the yield of which in the Victorian Government herd test for 273 days was: Milk, 15,799 lb.; average test, 5·34 butter fat; last day of test, 42 lb. milk. She commenced her lactation on 1st April, 1924, at the age of four years and 218 days, and concluded on 29th December. Her average daily output of milk was 57·87 lb., and of butter fat 3·09 lb.

To Control Cabbage Moth.

To keep cabbage plants free from cabbage moth persistent spraying in the seed beds, and later in the field, with kerosene, emulsion, or tobacco wash is useful. Experiments at Bathurst Experiment Farm, however, have shown that "Georgia mixture" is the most satisfactory spray to use. To make this mixture add 2 lb. of arsenate of lead to 50 gallons of water, and to this solution and one-sixth of a pint of a solution made up of 1 lb. resin, and ½ lb. fresh washing soda boiled in a quart of water until a clear brown liquid is obtained. This mixture can be sprayed up to within five weeks of using the vegetables.—W. B. GURNEY, Government Entomologist, in "Agricultural Gazette" of New South Wales.

Milk Recording.

The efficacy of milk recording, states "Scottish Farmer," is shown by the fact that of the 30,000 cows tested under the Scottish Milk Records Association, 39½ per cent. were in class I. in 1914, and 65 per cent. were in the same class in 1923. The average yield of all cows in Scotland is 4,700 lb., but that of recorded cows is 6,730 lb. Major Dudgeon, whose Ayrshires scored so handsomely at the London Dairy Show, has in nine years seen his returns creep up from 5,000 lb. milk to 8,000 lb. milk to the cow, which he attritutes to milk recording.

Schools and Forestry.

Valuable work in cultivating in the minds of school children a love for trees, is being accomplished by the Victorian Education Department by means of school plantations. In the December number of the "Gum Tree" (the official organ of the Australian Forest League) the schools forestry officer (Mr. W. W. Gay) gives interesting details of the progress being made.

Mr. Gay says that in the preliminary work of enlisting interest and support of the district people in the school plantation scheme, it is necessary to get these bodies behind the movement. In this way they are becoming more interested and enlightened in our forestry questions. Through the schools an endeavour is being made to educate the public. Municipal bodies have made application for addresses and information, with the result that during this year the following councils, as well as branches of the Australian Natives' Association and progress associations, have been addressed on the question of afforestation:—Daylesford, Beechworth, Castlemaine, Traralgon, Lexton, Maryborough, Clunes, Creswick, Ballarat, Ararat, Maldon, Geelong, Bright, and Kilmore. Opportunity is taken on every occasion to emphasise the work that might profitably be done by municipal bodies. Such instances as the Ballarat Water Commission's areas at the Gongong and the Moorabool, and the fine plantations along the roads on the Ballarat common are quoted.

To demonstrate the value of much of the waste Crown lands, and particularly the abandoned areas in old mining districts, blocks of from 25 to 50 acres are being reserved by the Lands Department for school plantation purposes. These areas, Mr. Gay continues, are being planted by the boys and girls at the rate of from 1 to 2 acres a year with softwoods or hardwoods, according to the locality. By this means, when the last compartment of 1 or 2 acres is being planted, the first compartment will be approaching a profitable cutting age. By co-operation with the Forests Commission the plants are supplied from the commission's nurseries at a nominal charge. Gradually the schools with plantations are also establishing nursery seed beds, and are raising the plants from seed supplied to them. This year several schools have raised their own seedlings. The interest of the child is thus maintained.

While every assistance is given by the Education Department to a school committee in obtaining possession of land, in providing trees and seed, and in giving instructions and advice, it is stipulated that the initial cost of enclosing the area with a serviceable rabbit-proof fence must be borne by the committee. Excellent response, Mr. Gay says, has been made, and municipal councils and public bodies, such as branches of the Australian Natives' Association and progress associations, have supported the school committees and staffs in obtaining the necessary fencing.

Already 1,200 acres of waste, idle land has been thus utilised for school purposes. Fifty-five plantations have been established in various parts of the State. In the last planting season 25,000 trees were put out in these plantations.

Fruit Marketing—Need for Control.

A strong complaint was made recently by the Minister for Works and State Enterprises (Hon. W. Forgan Smith) in respect to a faulty apple consignment to the State Cannery from the Stanthorpe district, and he submitted that the occurrence was a demonstration of the need for vigilance in inspection and of the support of the present fruit marketing system.

Mr. Forgan Smith said that from time to time criticism had been levelled at the Government for its efforts to enforce better methods of marketing fruit and for its desire that the fruit marketed should be properly graded and of good quality. An example of the need for unceasing vigilance on the part of inspectors was given by a consignment of apples sent from the Stanthorpe district to the State Cannery, which had undertaken to absorb a fair quantity of the surplus apples this year. This was the first consignment received, and an average sample of the whole consignment, which he exhibited, was, he declared, of a quality quite unfit for any use whatever. Any growers who sent such fruit were seriously damaging their own industry and hampering the efforts to improve their position. It was essential that such growers should realise that attempts to sell bad fruit would only recoil upon themselves and damage their prospects of successfully marketing their products.

Kurrajong Coffee.

Mr. J. F. Keane, of Carbeen, North Queensland, recently forwarded to the Department of Agriculture and Stock for trial a small sample of coffee made from the seeds of the North Queensland kurrajong. Mr. Keane, seeing a note in this Journal by the Government Botanist (Mr. C. T. White, F.L.S.) to the effect that the seeds of the ordinary kurrajong of the Southern States and Southern and Central Queensland were sometimes used as a substitute for coffee, made a trial of the Northern species and found it to be equally good. Mr. White, to whom the sample was submitted, says that he has tried the sample of kurrajong coffee kindly forwarded by Mr. Keane, and can vouch for its excellence as a substitute for coffee or cocoa. Personally, he thinks the taste more closely resembles cocoa than coffee. This is, perhaps, natural, as the kurrajong belongs to the same family of plants as cocoa (*Sterculiaceæ*). The seeds of the Southern kurrajong have long been used as a substitute for coffee first being roasted, and then ground in the same way as the ordinary sort. Mr. Fred. Turner, the well-known authority on Australian fodder plants and trees, some years ago forwarded some kurrajong seeds to Mr. W. M. Hamlet, of Sydney, for analysis, and Mr. Hamlet replied that the seeds contained 1·8 per cent. of the alkaloid "caffeine." This alkaloid is the active principle of both tea and coffee, and to it these plants owe their refreshing and slightly stimulating properties. The seeds of cocoa (*Theobroma cacao*) contain the closely allied alkaloid "theobromine." It certainly would be of interest to have an analysis made of the North Queensland species of kurrajong (*Brachychiton diversifolium*) to ascertain the chemical constituents. The North Queensland species of kurrajong, which also occurs in the Northern Territory, is a distinct species from the better known Southern tree, having more regularly shaped leaves, longer pods, and slightly different flowers.

Main Road Design.

In the January number of "The Commonwealth Engineer," Mr. J. R. Kemp, M.I.E., Aust., the chairman of the Queensland Main Roads Board, has an interesting article on "Some Broad Facts and Principles Governing Main Road Design in Queensland." Much of the article is too technical for the average reader, but Mr. Kemp explains that in deciding between alternative routes the board considers the capitalised cost of construction for each route, the capitalised cost of maintenance, and the capitalised cost of haulage, and weighs these according to the value of the area to be served, otherwise a cheap route might be selected that would serve only a few people. Consideration then is given to the width of the road, and to the selection of the material to be used. Before the thickness of the road crust can be determined the climatic conditions are studied, and the different soils are classified and analysed. Mr. Kemp points out that if an error were made in classifying a black sandy loam as heavy black soil there would be a consequent increase in cost of 66 per cent., because whereas the loam would need only a 9 in. thickness of paving the other would require 15 in. He adds: "Construction costs generally render it necessary in Queensland to adopt as the bottom course a material which will be easy setting, and capable of spreading wheel loads. Such a material need not necessarily have the hardness necessary for the top course, which is subject to high shearing and impact stresses, but should nevertheless be one which does not easily alter its physical condition under varying moisture content."

Staff Changes and Appointments.

Mr. J. P. Orr, clerk in the Fruit Branch, Department of Agriculture and Stock, has been appointed also Registrar of Primary Producers' Co-operative Associations.

Mr. F. P. Green, of Duaringa, has been appointed Government Representative on the East Leichhardt Dingo Board, and Messrs. C. A. Barnard, A. J. Salisbury, P. P. O'Brien, and J. W. McKenzie have been elected Members of the Board.

The Officer in Charge of Police at Maytown has been appointed an Acting Inspector of Stock.

The term of office of Members of the Babinda, Bingera, Farleigh, Invicta, Macknade, Maryborough, Moreton, Mount Bauple, Mourilyan, Plane Creek, South Johnstone, and Victoria Local Sugar Cane Prices Boards has been extended to the 28th February, 1925.

Effect of Muriate of Potash on Maize.

Fertiliser experiments with maize at Grafton Experiment Farm have shown muriate of potash to be a very unsatisfactory fertiliser for this crop. This is not to say that potash fertilisers are proved to be useless for maize, but that in the muriate form as obtained during the past few years the effect on the germination of the seed has been so deleterious as to offset any possible value it may have. Apparently some very acid principle in the fertiliser has been responsible for this, and in fact, was so strong as always to rot the bags in which the fertiliser was contained.—H. WENHOLZ, Special Agricultural Instructor in the "Agriculture Gazette" of New South Wales.

Prussic Acid in *Indigofera australis*.

Among the plants suspected of being harmful to stock is native indigo (*Indigofera australis*). Reference to the available literature on the subject indicates that the presence of hydrocyanic (prussic) acid in this plant has not been recorded, and that examinations of the plant have given negative results. Investigations now being carried out at the chemist's branch of this department show, however, that hydrocyanic acid is undoubtedly present. The plant in the green state contains .102 per cent. hydrocyanic acid, which is equivalent to 7.14 grains hydrocyanic acid per pound of plant. One grain of hydrocyanic acid is a lethal dose for a sheep, and this amount would be contained in about 2¼ oz. of the plant. Native fuchsia (*Eremophila maculata*) is regarded as one of our worst poison plants, and the *Indigofera* examined appears to be quite as potent.—A. A. RAMSAY, Chemist, in the "Agricultural Gazette" of New South Wales.

Harvesting Rusty Oat Crops.

The oat crops seem more affected with rust this season than the wheat, and before a farmer decides to cut a badly rusted crop for hay it would be well to go through it and locate the worst areas, leaving the best to be stripped for grain. This season at Cowra Experiment Farm it has been found that the heavy crop with an easterly aspect is comparatively free from rust, while the lighter growth facing the west is badly attacked. Where the growth has been checked or the crop is less vigorous on account of poorer soil the rust is often worst. In districts where threshing can be practised it might be well to cut the rusted crop for hay before it is quite ripe for grain. If not too badly rusted, the hay will be quite satisfactory and nutritious for use on the farm, though not presentable for market.

The present season affords a good opportunity to determine the rust-liable sorts, but we cannot afford to throw over a good variety because it is somewhat liable, as a rusty season seldom overtakes us. The worst offenders, however, must receive summary treatment. Such as Kelsall's, Calcutta, and Fulghum. One of the most rust-resistant of oats is White Tartarian. We are using this variety in crossing experiments, or its sister, Reid's New, with encouraging results.—J. T. PRIDHAM, Plant Breeder, in the "Agriculture Gazette" of New South Wales.

The Cost of Wheat Production in the United States.

The Bureau of Agricultural Economics of the United States Department of Agriculture has issued some interesting figures on the cost of producing certain field crops in 1923. In the cost figures are included charges for labour of the farmer and his family, and a charge for the use of the land on a cash rental basis; so that if the cost just equalled the price, the farmer was paid for his time and his investment. The several items of cost per acre include preparation and planting, cultivation, harvesting, marketing, miscellaneous labour (including irrigation and

water, spraying and spray material), fertiliser and manure, seed, land rent, and miscellaneous costs (sacks and twine, crop insurance, use of implements, use of storage buildings, and overhead).

A summary of 997 reports showed that the average gross cost of producing an acre of wheat amounted to 24.99 dollars (approximately £5 4s. 1½d.) in the western division in 1923. The credit for straw was 1.04 dollars (4s. 4d.) per acre, leaving an average net cost of 23.95 dollars (£4 19s. 9½d.) per acre and 1.09 dollars (4s. 6½d.) per bushel, the average yield being 22 bushels per acre. The average sales value per bushel was 87 cents (3s. 7½d.), and the value per acre was 4.56 dollars (19s.) less than the cost per acre.

This does not represent an actual cash loss; it does mean, however, that many farmers did not receive sufficient income from wheat to pay all cash expenses of production, and to allow them ruling wages for their time and the cash rental value of their land as reported.

Ratoon Cotton.

The following extracts from recent letters from two cotton-growers in widely separated areas are interesting:—"The ratoon cotton is very disappointing. So far not more than 25 per cent. of the plants are showing growth, and I am unable to see any sign of buds swelling. We shall be unable to do any further work on it until after harvest (wheat), by which time we should be able to see definitely whether it is worth persevering with. Many of the plants which have made growth are badly infested with aphis." The second grower writes: "Ratoon cotton—This is not sprouting at all well, and I doubt if it will be worth while following up. I am considering whether to plough through the 30 acres and replant."

Crossbreeding for Commercial Purposes.

For strictly commercial purposes there is not a word to be said against an extension of the system of cross-breeding, whether it be in cattle, sheep, or pigs, but we must be very careful to see to it that cross-breeding is conducted on sound principles, or else there may soon be a tendency to mongrel-breeding, for that is the end of cross-breeding if it is not carried out on a proper and recognised system. If cross-breeding is to continue to play an important part in the production of high-class stock for commercial purposes, the value of purebred parents on both sides must be fully realised. The produce of a pedigree sire of one breed and a pedigree dam of another breed is essentially a pedigreed animal itself, and will probably inherit the good qualities of its ancestors on both sides, and, incidentally, some of the bad ones as well.

In cross-breeding, provided the parent stock is good on both sides, good qualities do seem to come out, and this because some of the good qualities have been, perhaps, lying dormant in one side or the other, and the strong outcross has been the means of bringing it into life again. The best results are obtained from first crosses, and on no consideration should we go beyond a second cross, and the sire must always be purebred. On no consideration should a crossbred sire be used.

This leads us to the position of the pedigree-breeder when he sees so much cross-breeding in vogue. The more we see a proper and recognised method of cross-breeding extended, so much the more will pedigree stock be in demand. The one cannot be carried on without the other, and there will be no slackening in the demand for pedigree sires for crossing purposes. Let us eliminate the scrub bull, the scrub ram, and the scrub boar, and make it impossible for other than purebred bulls and boars to be used for crossing purposes.—"New Zealand Farmer."

The Hardest Worker on the Farm.

Cows are in reality the hardest worked animals on the farm. A horse at hard labour is not using more energy than a dairy cow does when she is producing an average flow of milk for a good cow. Horses on the farm work only six days in the week, and cost accounting records show that they work only three and one-third hours a day, on the average for the 313 working days in the year; while good dairy cows work continuously, Sundays and holidays included, and for 320 days out of the 365 each year. Yet because she spends most of her time standing around or lying down, we think she is idle if not lazy, and do not realise the great need of saving all of her energy possible to put into milk production.

In twenty herds observed on 21st June, there were 576 cows standing and only seventeen lying down, and twelve of these were in one herd on good pasture. In the thirty-four herds observed on 26th and 27th June, there were 688 cows standing, and only nine lying down.

The fact that cows are on their feet and walking a great deal of the day while on grass pasture is not often considered by dairymen, but this waste of energy must surely have a detrimental effect on the flow of milk.—"Hoard's Dairyman."

Dairy Farm Equipment.

While the utensils necessary for the production of milk are hardly machinery in the true sense of the word, there are many articles of equipment which contribute to the success of milk production from the hygienic standpoint.

The first essential for clean milk production is the thorough cleaning of the cow. This work is greatly facilitated by the use of ordinary hand clippers, which should find a place on all dairy farms, in order that the hairs on the udder may be clipped at intervals, and the flanks kept free from long hair, which encourages the accumulation of dirt and makes cleansing difficult. In addition to clippers, a brush, two cloths, and two ordinary galvanised iron pails for washing the udder and flanks will be necessary.

The old type of open milking pail is now being largely superseded by the covered, or domed type, which is of proved efficiency in excluding dirt from the milk during milking. There are many variations of the domed pail now upon the market, but the essential feature is the position of the opening which should be set as nearly vertical as possible, and should measure about 5 inches by 7 inches. The more nearly the opening approaches to the vertical the greater the chance of excluding dirt.

In spite of the greatest care being exercised in milking, small particles of visible dirt will from time to time find their way into the milk. Efficient straining is therefore necessary. The construction and position of the receiving tank is a matter for consideration. If the dairy immediately adjoins the cowshed, the receiving tank with a hinged cover may be fixed on the cowshed wall and communicate, by means of a short length of movable piping, with the strainer in the cooling room. The capacity of this tank should not be less than six gallons for ordinary purposes.

The best type of strainer is that which incorporates a cotton-wool disc which is found to be an excellent barrier against the passage of dirt. The disc should be enclosed between perforated metal plates, which serve to keep the cotton-wool disc in position and receive the impact of the milk, and prevent the formation of holes. The metal plates may be replaced by coarse discs of gauze, which should not, however, be regarded as strainers, but rather retainers of the cotton-wool disc, which should always be as large as possible.

The rail churn has in the past proved to be a fruitful source of contamination because of errors in construction. The first necessity is accessibility, and, in this respect the 10-gallon churn should always be selected. It is of such a depth that it can be easily cleaned, and is more readily handled than the 17-gallon size. The best type of lid is one which is provided with a slightly domed top and overhanging edge, as it does not allow water to accumulate or permit of the return of spilled milk to the bulk. All churns should be free from seams and crevices.

For small farms where the number of cows in milk does not exceed 15, excellent sterilisation is possible with a farm copper or a simple steam outfit.

Nearly all farms are equipped with some form of ordinary domestic copper. This can be adapted for sterilisation purposes at small cost, and, within the limits of its capacity, is quite efficient. A hole measuring about 2 inches in diameter is bored in the existing lid, from which any handles must be removed. A short length of piping to act as a steam duct is fitted in this hole, thus providing the means of steam sterilising churns, and, if necessary, pails. For the cooler, strainer, cloths, receiving tanks, and, perhaps, the pails, a special closed receptacle must be provided.

As a steaming tank a galvanised iron tank with the bottom perforated with numerous ½-inch holes may be used. An ordinary large size sanitary dustbin, with perforated bottom, serves the purpose well, has the merit of cheapness, and is easy to obtain.

The simple steam steriliser is, in principle, exactly similar to the converted farm copper, except that the heat is supplied by two Primus oil stoves, and in some cases by gas. It consists of a boiling pan holding about 1 to 1½ gallons of water, supported on a frame over two Primus stoves. This pan is provided with an insulated lid through which passes a short pipe acting as a steam duct for sterilising churns. The cover is replaced by a galvanised iron box with a movable cover into which the cooler, strainer, &c., can be packed when the steaming of the churns is completed. This is a very economical method of sterilising the utensils, and is small, compact, and portable. The cost for fuel for a herd of twenty cows should not exceed 3s. per week. Whatever means of raising steam for sterilising is adopted that most important item of equipment, the thermometer, should always be fitted into the plant, and every endeavour should be made to attain and maintain a temperature of 210 degrees Fahr. or higher throughout the steaming process.—"Agricultural Gazette," U.K.

Cotton—Recent Research Work.

An inspection was made by the cotton specialist (Mr. Wells) recently, of the Cotton Research Station at Melton, where the Department of Agriculture, in conjunction with the Empire Cotton Corporation and the Commonwealth Government, is conducting experiments to ascertain the cultural methods most suitable for the growing of Durango cotton in that area. A striking illustration of the effect on the growth of a cotton plant that thinning has at different stages of the plant's development was shown in an experiment in which small blocks of the plants were thinned when they were 4, 6, 8, 10, 12, and 15 inches in height respectively. The plants in the blocks which were thinned when the plants were from 4 inches to 6 inches in height were of a blocky, thick-stalked nature—well laden with squares which were soon to commence flowering, while the plants which were thinned when 12 inches and 15 inches high were of a slender, spindly stalked type, with just a few squares developing in the top of the plant.

Another experiment of decided interest was that demonstrating the value of cross-harrowing in the early stages of the development of the plant. Material advantage had been obtained by cross-harrowing with a spike-toothed harrow, in that the amount of cultivating with a machine and hand chipping had been greatly reduced in the period before the plants were thinned, and if the season had been less favourable it is believed that the extra mulching in the row around the plants would have been shown to be of decided assistance in conserving the moisture. Close examination of the plants failed to show any signs of injury having been done to the plants, even where harrowed once a week, and from the results obtained in the experiment and also from the experiences of growers in other districts it appears that where the grower has a good strike he may do very efficient work with the spike-tooth harrow up to time of thinning when the plants are 4 to 6 inches in height.

The Woman on the Land.

"The man on the land may make a periodical valuation of his live stock and dead to determine his financial position. He will write off a certain amount of depreciation, but which of us can place a valuation on the best asset we have—our women folk—and who will calculate the amount of depreciation brought about by impaired health, often the result of our own thoughtlessness or indifference?"

This challenge was made to fellow-agriculturists by Mr. W. L. Davies, of Kalangadoo, in the course of a paper read at the women's session of the recent congress of the South Australian Agricultural Bureau.

There were many settlers who went on the land who, to his mind, seemed to start at the wrong end of the job, said the speaker. He knew only too well that funds would not allow them to do all that they would wish, but there were some who seemed to think that, while Dobbin must have a nice warm stable, anything would do for mother and the youngsters until they could get a start, and the start often took so long to accomplish that by the time the nice big new house was built the youngsters had scattered, and mother somehow did not seem to have much appreciation left for her altered circumstances.

He once knew a man who would never let his horses stand in the dray for ten minutes without slipping the nosebags on their heads, yet for twenty years his wife milked anything up to half a dozen cows in a bail in the open without a roof of any sort to shield her from the rain and sun. And that was in timbered country, and within a short distance of enough thatch to cover acres of sheds.

"There isn't much joy in milking cows under any conditions," continued Mr. Davies, "but if it has to be done the least we can do is to see that the yards are kept as clean as possible, and a dry shed is provided. A cow when brought in out of the rain can be dried quickly with a hoop-iron bow, but when a further supply keeps falling and running off her on to the unfortunate milker it is enough to make a person break all the commandments and kick the cow."

Another of the significant things was the distance from the water tank to the kitchen. Multiply it by the number of times that mother or Mary walked to it or back in a day, and that might help to account for mother or Mary being tired at night. Perhaps with a bit of piping a lot of walking might be avoided. Then there was the position of the clothes lines. He had seen them erected in the big yard, and when Tom or Dick came in with the horses, and let them go for a drink they rolled and kicked up as much dirt as a Broken Hill storm, and then went and rubbed their backs on mother's clean sheets and Sunday-best tablecloth. Convenient appointments in the washhouse and woodshed were very necessary. No woman should ever have to cut the house wood, except in extreme cases.

Some men had a decided aversion to doing anything on a Sunday, except enjoying a good dinner and taking what they considered to be a well-earned rest for the afternoon; but did they not forget that the house that seemed so inviting to them had been the scene of mother's and Mary's labours all the week, and a little outing occasionally was very pleasant to them. They liked to go out with father better than with any one else—at least mother did. "So instead of having that sleep," counselled Mr. Davies, "put old Dobbin in the trap, or run out the old Ford, and take her out for a joy ride to give fresh heart for the next week."

Pig Raising in the South Burnett.

The Instructor in Pig Raising to the Department of Agriculture and Stock (Mr. E. J. Shelton) has recently returned from an extensive tour through the South Burnett district, one of the principal maize belts of Queensland, noted also for its dairying and mixed farming.

That pig raising is becoming an extensive and important industry in the South Burnett, and is destined to develop even more rapidly in future years, has been amply evidenced by the keen interest taken in the visit of the Instructor to many local centres in all of which either lantern lectures, short addresses, or personal talks to farmers interested in pig raising were given. The State schools in the several centres, when possible, were also visited and addresses given to the children. Included in this part of the itinerary were the schools at South Nanango, Sandy Ridges, Coolabunia, Kumbia, Inverlaw, Kingaroy, Brooklands, Crawford, Memerambi, Wooroolin, Home Creek, Keysland, Cloyna, Windera, Merlwood, Murgon, Manyung, Cinnabar, Woroon, Byee, Chelmsford, Proston, Speedwell, Kinleymore, Abbeywood, Mondure, Moffatdale, and Wondai.

Visits were also paid to the Soldier Settlements in company with Mr. J. Wilson, Supervisor of the Burrandowan Soldier Settlement, Kingaroy, at Taromeo, South Nanango, Rocky Creek, Neugma, Tarong, Boyneside, Burrandowan, Gordon Brook, and Charlestown, at all of which most of the ex-service men, and in several instances their wives and children, were present at the lectures, and exhibited considerable interest in this, one of the most profitable adjuncts to general farming.

It would be difficult to imagine a district more favoured than the South Burnett in respect to climatic conditions, soil, environment, ease in marketing, and reasonable means of transport. The soil is equal to the best in Australia; climatic conditions—whilst somewhat variable and subject to dry spells—are approaching the ideal. The rainfall is, in most seasons, sufficient to provide for the growth of practically every crop recommended for pigs; and water conservation is extensively practised. In addition, the underground water supplies, as shown by numerous wells and sub-artesian wells, are substantial. The environment is good, stock is in splendid condition, and there is a marked freedom from disease, particularly where pigs are given reasonable care and attention. With improved pastures in the form of pig paddocks and with better accommodation generally, there is no reason why the stock should not continue to be perfectly healthy. The means of transport for pigs to market are as good as in any other part of the State, and though there is room for improvement, particularly in the prevention of excessive bruising by more careful handling of the stock in transit from the sties on the farm to the killing floor at the factories, the Instructor noticed that especial care is being given to this matter, particularly by the official loaders and agents. Stock is transported as rapidly as conditions will permit from loading stations to destinations.

The provision of suitable accommodation for the pigs in the form of extensive pig paddocks and shelter sheds and in suitable farrowing sties was stressed as being the outstanding need of the district.

The general standard of the quality of the pigs in the South Burnett, in Mr. Shelton's opinion, is well above the average, and though there is still room for improvement, there is far more need for better accommodation than for more breeds or types. It is, however, apparent from the keen interest displayed in the course of the visit, that everywhere farmers are waking up to a realisation of the fact that the pig needs better care and attention, better sties and paddocks, better and more readily grown farm foods and more efficient marketing in order that the margin of profit over cost of production should be widened, and the farm profits enhanced generally. The school children throughout the district listened attentively to the lectures and their interest in the subject was practical and keen.

It is the desire of the Department of Agriculture and Stock to keep in touch with all those interested in pig raising, and inquiries addressed at any time to the Department will receive prompt attention.

Rainfall at Gatton.

The rainfall record at the Queensland Agricultural College at Gatton for October, November, and December, 1924, reads:—

October	167 points
November	315 points
December	419 points

Oiled Paper for Packing Apples.

The use of oiled paper for packing apples is on the increase among American growers. At least one-third of the commercial crop, or between twelve and fifteen million boxes, in the various north-eastern shipping sections were wrapped this season, it is stated, as compared with about 600,000 boxes last season. The use of oiled paper is said to have had the effect of preventing or much reducing damage by scald in common or cold storage or in transit. So successful has this style of wrapping proved that many packing houses are stamping their boxes with the words "oiled wrap."

What America is Doing to Wipe Out Tuberculosis.

That as many as thirty States will be entirely free from tubercular cattle within the next eight years is the prediction of the United States Department of Agriculture, which reports encouraging results in the eradication of this plague. During the year ending 30th June, 1924, the accredited herds in the country have increased from 28,526 to 48,273, and more than 5,000,000 cattle have been tested. About 3½ per cent. of all the cattle in the country are still tubercular, although certain areas are already entirely free from the disease. With the cleaning up of larger areas the veterinary forces can be concentrated on the States where the infection is greatest, and it is but a matter of time, apparently, until cattle tuberculosis will be practically a thing of the past.

PLATE 23.—IN A STANTHORPE ORCHARD—A PEACH AMONG THE BLOSSOMS.

Answers to Correspondents.

Weed Eradication.

"TIME SAVER" (Booyal)—

There is no royal road to weed-free land on the lines suggested. Greater success would follow the vigorous use of a brush hook or hoe lubricated with elbow grease.

Injury to Horse's Foot.

"GEE GEE" (Booyal)—

Veterinary Officer J. A. Rudd advises us that it is not possible to state definitely without an examination whether anything serious is likely to develop. Apply the following blister to the part affected:—Biniodide of mercury, 1 part (1 drachm); lard, 8 parts (1 oz.). Clip the hair around the wound and also the enlargement surrounding the wound, apply the blister, and rub in for 15 minutes. After the lapse of 21 days a second application may be advisable. The horse should be tied up for 48 hours after the application of the blister and kept off muddy waterholes for at least 6 weeks.

Risks of Parturition.

A Stanthorpe correspondent writes:—

"I had a cow die just after calving. The calf lived; this being her second one. The cow was in pain all day and calved some time during the night. Is it natural for a cow to be bad so long? The cow was in good condition. She had been fed on green barley. What would you think was the cause of her dying?"

Mr. Rudd, of the Veterinary Staff, advises that probably there was slight rupture of the uterus (breeding bag), and the fluid contents entered the abdominal cavity and death resulted from peritonitis. There is always a certain amount of risk during parturition, particularly if a cow is in a very high condition.

This correspondent did not supply his name, otherwise an answer would have been sent to him by first following mail.

Lice on Pigs.

H.G.D. (Cooroy)—The Instructor in Pig Raising (Mr. E. J. Shelton) advises:—

Dipping pigs for the purpose of freeing them from lice will not be found satisfactory, for the reason that the pig is an extremely stubborn creature to handle when it comes to forcing him through a dip the same as is freely done with cattle and sheep, hence automatic pig oiling machines, which act as rubbing posts, have been invented. The machines, which may be erected in the pig yard, cost about £4 each delivered in crate Brisbane.

The best local remedy, apart from the application of lice mixture per medium of the hand or a cloth or brush attached to a broom handle, is to erect rubbing posts in the pig yards; wrap a corn-sack or chaff-bag around these posts; affix same by means of soft rope or twine and saturate this bag with a mixture of kerosene and fat, or crude oil. The pigs will very soon learn to rub against this post, and you will find they free themselves from lice fairly well. The mixture recommended for ridding pigs of lice is made up of—

½ pint benzine;
½ pint kerosene;
7 pints some cheap grade of oil, like fish oil, draft castor oil, linseed oil, or crude oil.

It is always advisable to give a second application of oil about a week after the first in order to kill off the young brood of lice.

Construction of Pig Sties.

W.F.L. (Boonah)—

We have at present no illustrated pamphlet on the construction of pigsties. A pamphlet on the subject is in the course of preparation, a copy of which you will be able to obtain later. The Instructor in Pig Raising (Mr. E. J. Shelton) advises that in making a fattening place a good, roomy yard, at least half a chain square, should be planned. A comfortable shelter, not less than 20 ft. by 10 ft., conveniently placed, should be provided within the enclosure. A wooden sleeping floor would be preferable in this shed and it is suggested that you lay down a concrete, or brick and cement, feeding floor, 10 ft. by 10 ft., on which the feeding trough could be placed, and have this as near to the food supply as convenient. It is better to spend money in providing a feeding floor of this description than to spend it on a brick sleeping floor, for a wooden platform on which the pigs could lie would be necessary, even if the floor of the shelter shed were of brick or concrete.

It is certainly not advisable to shut pigs up in a small sty to fatten them, for the great demand in these days is for fleshy bacon pigs carrying a fair proportion of fat, but not fattened to excess. This means that an endeavour must be made to keep the pigs putting on flesh as well as fat up till the time they are ready for slaughter. This in turn means that the pigs must have abundant exercise and liberal supplies of protein (flesh forming) food during the final topping-up stage; the pigs also require to take exercise and to have ample supplies of drinking water available. You will find pigs fattened in this way are far more satisfactory than would be the case in respect to small sties. We are posting you several Journal extracts on "Pig Raising." Other extracts will be available later.

Molasses as Pig Food.

K.R. (Ringwood)—

In reply to your inquiry as to whether a ration of boiled prickly-pear and molasses would be a suitable ration for fattening pigs, particularly if used with skim milk, the Instructor in Pig Raising (Mr. E. J. Shelton) advises that molasses is purely a carbonaceous food, therefore is only a heat or energy producing nutrient; it has absolutely no value as a flesh-forming nutrient, as molasses contains no proteins (*i.e.*, the flesh-forming portion of stock foods). There is no truth, for instance, in the common statement that 1 lb. of molasses is equal in food value to 1 lb. of maize. The chief value of molasses as a stock food, according to the Agricultural Chemist of this Department (Mr. J. C. Brünnich), lies in the fact that its addition to dry, coarse fodders makes them more palatable and stimulates the appetite. There is in molasses, however, a large amount of soluble salts of potash and lime and some amides. These sometimes act adversely on the digestion, and unless molasses is fed in moderate quantities the result may be that the animals will suffer from diarrhœa.

The best way in which to use molasses is to measure off the quantity to be used (young pigs should not be given more than from ¼ to ½ lb. per day, and the amount for breeding sows should not exceed 1 lb. per day), dilute it with two or three parts of hot water, and mix it with the other foods immediately before feeding. We would not recommend attempting to fatten pigs on boiled prickly-pear and molasses, as the ration could be considered quite unsuitable; its use could only be advised as a maintenance diet for animals in reasonable condition during a dry spell. It certainly would be improved by the addition of skim milk, but you must remember that in feeding prickly-pear you are forcing the animal to consume a large bulk of fibrous matter of little food value. Prickly-pear would need to be scorched before use to destroy most of the prickles, as they would not be softened sufficiently by boiling.

We would rather suggest your conserving food in the form of grain and hay for dry time use, as this would be of much greater feeding value and would not entail extra labour. Lucerne hay can be fed to advantage if chaffed and soaked in water before use, and it would be preferable to crush and soak the maize also, particularly for young pigs. Any further information required will be gladly supplied.

Pig Raising.

G.W.L. (Brisbane)—The following information is supplied in answer to your inquiries by the Instructor in Pig Raising, Mr. E. J. Shelton:—

1. *Cost of good breeding sow.*—You should be able to secure suitable breeding sows at any time at from eight to say twelve months old, either in-pig or ready for service, at up to ten guineas each. This price would be for a sow showing good type and quality and coming from a reliable herd. When you are ready we will be able to secure details of suitable stock. One line of seven purebred Berkshire sows, five and a-half months old, and from a prize-winning herd is at present offering at six guineas each, crated on rail, Murphy's Creek, near Toowoomba. These sows should develop into ideal breeding stock.

2. *The Boar.*—It pays to secure a really high class boar; his price would vary from ten to twenty guineas according to selection and age. Opportunity frequently offers to secure reliable active boars ready for service at the prices mentioned—boars that have proved reliable stock getters.

   On the basis of the above figures a herd of thirty breeding sows and two boars at from eight to twelve months old would cost in the vicinity of, say, thirty sows at eight guineas each, and two boars at, say, fifteen guineas—270 guineas, or roughly, say, £300. Of course these would not all be purchased at the same time unless your property was fully developed. We do not advise purchasing the low-priced low-grade sows or boars. On the other hand it is not necessary that the breeding sows should be expensive. Careful selection and tactful buying counts for much in the stock world.

PLATE 24.—POWER SPRAYING ON AN ORCHARD IN THE GRANITE BELT.

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

The excellent rains recently experienced should have a heartening effect on all farming operations, as a good season may now be reasonably expected.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production. Weather conditions, particularly the recent heavy and continuous rains, have interfered a great deal with farming operations. Although abundant supplies of grasses are in evidence, provision should be made for the inevitable period, at maturity, when these lose their succulence.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description suitable for coastal districts and localities, where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth, which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of one pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early-ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

PLATE 25.—A STOOK OF PHALARIS GRASS, HERMITAGE STATE FARM, WARWICK.

(*See* letterpress, page 75.)

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	JANUARY.		FEBRUARY.		MOONRISE. JAN.	MOONRISE. FEB.
Date.	Rises.	Sets.	Rises.	Sets.	Rises	Rises.
					a.m.	p.m.
1	5 1	6·49	5 26	6·46	11 17	12 33
2	5 2	6 49	5·26	6·45	11 59	1·26
					p.m.	
3	5·3	6·49	5·27	6 45	12 55	2·17
4	5 3	6·50	5 28	6·44	1·47	3 9
5	5·4	6·50	5·28	6·44	2·41	4 0
6	5 5	6·50	5·29	6·43	3·31	4·48
7	5 6	6·51	5 30	6·42	4·22	5·36
8	5 6	6 51	5·31	6 42	5·12	6·16
9	5 7	6 51	5 31	6 41	6 3	6 54
10	5·8	6·51	5·32	6 40	6 51	7·35
11	5·9	6·51	5·33	6 40	7 35	8 11
12	5 9	6·51	5 34	6 39	8·18	8 47
13	5·10	6·51	5 34	6·38	8 57	9·27
14	5 11	6 51	5·35	6 37	9 33	10 4
15	5 12	6 51	5 36	6 37	10·10	10 44
16	5 13	6·51	5 36	6 36	10 47	11 29
17	5·13	6·51	5 37	6·35	11 23	...
						a.m.
18	5·14	6·51	5·38	6 34	...	12 11
					a.m.	
19	5·15	6 51	5·38	6 34	12 4	1·11
20	5·16	6·50	5·39	6·33	12 46	2 11
21	5·16	6 50	5 40	6·32	1 34	3·15
22	5·17	6 50	5·40	6 31	2 26	4 21
23	5·18	6·49	5·41	6 30	3 33	5 25
24	5·19	6 49	5 42	6·29	4·29	6 28
25	5 19	6 49	5 42	6·28	5·34	7·29
26	5·20	6·48	5·43	6·27	6·42	8·28
27	5 21	6·48	5·44	6 26	7 46	9 27
28	5 22	6 48	5 44	6 25	8·48	10 22
29	5 23	6 47	...	...	9 48	...
30	5·24	6 47	...	...	10·44	...
31	5·25	6·47	...	...	11·38	...

Phases of the Moon, Occulations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

2 Jan.	☾	First Quarter	9 25 a.m.
10 „	○	Full Moon	12 47 p.m.
18 „	☽	Last Quarter	9 33 a.m.
25 „	●	New Moon	12 45 a.m.

Apogee, 8th January, 6 30 p.m.
Perigree, 23rd January, 11 30 p.m.

There will be a total eclipse of the sun, occurring on the other side of the world, about midnight of the 24th. It will be visible on a narrow track in Canada and across the Atlantic to the northward of Scotland. Other phenomena will be invisible in Australia. Mercury will be at its greatest elongation west of the sun on the 20th and, therefore, visible before sunrise during the latter part of the month. Venus, Jupiter, and Mercury will be in remarkably close conjunction before sunrise on the 22nd. Mercury, the smallest, will be to the west of Jupiter, and Venus, the most brilliant, to the east.

1 Feb.	☾	First Quarter	2 43 a.m.
9 „	○	Full Moon	7 49 a.m.
16 „	☽	Last Quarter	7 41 p.m.
23 „	●	New Moon	12 12 p.m.

Apogee, 5th February, 5 6 a.m.
Perigee, 21st February, 5 0 a.m.

Venus and Mercury will be apparently close to one another in the early mornings of 3rd and 4th February. A partial eclipse of the moon will occur on 9th February, soon after the moon has set in Queensland. Saturn being in quadrature with the sun on 3rd February will rise about midnight. Two other eclipses will occur this year, one of the sun in July, and one of the moon in August. Both of these will be visible to some extent in Queensland.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

This month Major Arthur H. Cory, M.R.C.V.S., Chief Inspector of Stock, gives interesting information relative to stock in Queensland; Mr. P. Rumball, Poultry Instructor, has contributed a paper on the handling and marketing of eggs; whilst potato variety trials in the Mary Valley district are discussed by Mr. C. McKeon, Instructor in Agriculture. "Necrotic Enterites in Pigs" forms the subject of an article contributed by Mr. W. L. Hindmarsh, M.R.C.V.S., of the Department of Agriculture in New South Wales; and the control of pests in citrus culture is dealt with by Mr. R. L. Prest, fruit inspector. The advantages of central co-operative packing sheds are pointed out by Mr. C. V. Henry. In addition the regular features of the "Journal" are published, and some remarkably good photographs serve to illustrate the several contributions.

Shortage of Cattle Predicted.

The chairman of Bovril Australian Estates, Ltd. (Sir Cornthwaite Rason), in addressing the annual meeting of that company in London on 19th December, predicted a shortage of cattle in Australia. Sir Cornthwaite Rason said he had been informed that such a situation would occur within a short period. Owing to the high values of merino wool many stationowners were going out of cattle-breeding and into sheep-breeding.

Minerals for Calves.

Calves sometimes suffer from a lack of minerals in their feed, and this can be satisfactorily remedied by mixing 1 or 2 oz. of cod liver oil in the milk daily. Home-made mineral mixtures are also helpful, and such a mixture should contain common salt, ground limestone, ground bone, and a little sulphur and sulphate of iron. The best method of keeping the young animals right in this respect is to supply a variety of good food. All the constituents necessary for the normal growth of calves are abundantly present in milk, skim-milk, whey, good mixed hay, and pure wholesome grain, and top-dressed pastures. With these available, it is within the scope of every farmer to rear good calves.

Patent Butter Boxes.

Three small parcels of Queensland butter in Brennan's patent boxes arrived in London recently. The idea of allowing cold air to circulate by means of grooves cut in all sides of the boxes is regarded as good, and as being likely to economise space by obviating the use of battens.

Superphosphates for Roots.

A type of manuring that almost always pays for itself is the use of superphosphates for the root crop. This manure has a marked effect on the rate of root development; it causes the young plant to push ahead, and goes far to ensure a good growth in difficult seasons. Indeed, so successful has superphosphate proved in promoting root growth that farmers use it on all root crops, including mangels and potatoes, and sometimes apply considerable quantities per acre. There is evidence to show that these larger dressings are better split up over the rotation rather than given in one quantity to the roots. For superphosphate has another effect; besides increasing root development it promotes earlier seed formation. This property is of great value when cereals are grown in high-lying or backward districts; but it is not wanted for the root crop where, indeed, it would have the disadvantage of checking growth before the plant had really finished for the season. It appears wiser therefore, to give moderate but not large dressings of superphosphate to the root crop, and to give a dressing to the cereal crops, especially to the barley in which the seeds are to be sown.

Good Friesian Returns.

Some fine returns are to hand of Friesian cattle in the New Zealand official test. Four cows gave well over 3 lb. of butter-fat per day during the month of October, all giving over 80 lb. of milk per day. The top yield was from Monavale Queen Bess, which gave 741 lb. of butter-fat in 365 days as a two-year-old; and, milking only from three-quarters as a four-year-old she gave 800 lb. of butter-fat in the year. Nine mature Friesians have given over 600 lb. fat, their average yield being 19,570 lb. milk, 684 lb. fat, in 365 days. Three cows of the Ashlyn strain averaged 16,520 lb. milk, 643 lb. fat. Several cows of this strain have been recently introduced into Victorian studs.

What Is It?

A harmful insect, as dreadful as the locust, which is said to have transmigrated from Japan, has done great damage to crops in the United States during recent years, and Dr. Illingworth has been appointed by the United States Department of Agriculture to study the life history of the insect and its natural enemies (says a Chinese publication). An institution for the study of the insect larvæ in China is being organised in the compound of the Bureau of Entomology of Kiangsu Province, Nanking. Mr. Jaynes will be in charge of the institution.

A Weed Scavenger.

The sheep is the greatest weed scavenger extant. No other animal consumes waste products of the farm so efficiently (says an American exchange), and no other is so valuable as a cultivator of summer fallow and a fertiliser of soils generally. Many a flock from 25 to 200 improves the farms of their owners, adding cash money to the bank account. One farmer in U.S.A. started with four ewes four years ago, and now has a profitable flock of 100 head. Another got his start with a baby lamb that fell from a sheep train passing by his farm. He is now looking for neighbours with weeds in their summer fallow to feed his flock of fifty or more good sheep.

Water Suitable for Stock.

Mr. A. A. Ramsay, chemist for the New South Wales Department of Agriculture, in a recent issue of the Agricultural Gazette'' of New South Wales, gives some interesting particulars regarding waters suitable for live stock, based on numerous analyses and experiments. From the data collected he derives the following summary:—1. That horses will thrive on water containing 400 grains common salt and 550 grains total solids per gallon, and provided that they are not worked may be sustained on water containing 638 grains salt and 950 grains total solids. Water containing as much as 798 grains salt and 1,022 grains total solids has been used for a period of three months without ill-effects. 2. That cattle will thrive on water containing 800 grains common salt and 1,000 grains total solids, but when the concentration reaches 970 grains salt and 1,300 grains total solids they are injuriously affected. 3. That sheep will thrive on water containing 800 grains common salt and 1,000 grains total solids, and will do well even up to 1,197 grains salt and 1,350 grains total solids. When the concentration reaches 1,277 grains common salt and 1,868 grains total solids the sheep are injuriously affected.

QUEENSLAND STOCK IN 1924.

BY MAJOR ARTHUR H. CORY, M.R.C.V.S., Chief Inspector of Stock.*

Stock Statistics.

The following are the comparative figures supplied by the Government Statistician:—

Year.	Horses.	Cattle.	Sheep.	Pigs.
1923	714,005	6,955,463	17,641,071	160,617
1924	661,593	6,396,514	16,756,101	132,243

The decrease in number of stock is primarily due to the severe drought conditions which prevailed until the latter end of December in the Central and Southern districts, and until a later period in the Northern areas. Further beneficial rainfall in February and March relieved practically the whole of the pastoral areas of the State.

Prior to the advent of the rainy season, thousands of starving sheep were trucked to the Cloncurry district from Hughenden, Richmond, and Winton districts for relief purposes, and one station alone trucked no less than 43,000 sheep. It is estimated that approximately 400,000 sheep were on agistment in the Cloncurry and Normanton districts.

Notwithstanding the disadvantages which stock-owners from time to time experienced, it is satisfactory to note the growth of the pastoral industry since Separation. In 1860 the returns show a total of 23,504 horses, 432,890 cattle, and 3,166,802 sheep in this State. A decade later the number of horses had nearly quadrupled, the return of cattle had more than doubled, and the number of sheep reached a total of over 8,000,000. The sheep returns reached a maximum in 1894 with a total of over 23,000,000, and the highest returns for cattle were shown in 1921, when the figures reached over 7,000,000.

Cattle values have shown a slight improvement in comparison with the figures for the preceding year, and the truckings to the various meatworks have been correspondingly greater. It is anticipated that the cattle industry will shortly improve as there is every prospect of a revival of overseas trade and there is a growing demand for beef in the Southern States.

The extension of the North Coast Railway to Townsville has provided the Northern cattle-owners with an opportunity to take advantage of the Southern markets. A few consignments of stock have already been conveyed from the Gulf country and North-Western areas to Brisbane, with practically no loss or deterioration.

Owing to an outbreak of rinderpest in Western Australia, the introduction of all stock, fodder, and fittings was prohibited from that State until the disease was eradicated. This embargo remained in force for a period of three months, but was removed in March last.

The sheep industry still maintains its prosperity, and Queensland holds its proud position as one of the leading States in the Commonwealth in the production of wool and mutton. There is, however, of late years a tendency amongst stock-owners to occupy and stock smaller holdings in the more closely settled coastal areas. Queensland may be characterised as essentially a merino State, in view of the fact that British breeds and their crosses only amount to 3 per cent. of the total number of sheep in the State. As there is no indication of a drop in the wool market, it seems not too optimistic to say that there is a very bright future before Queensland sheep-owners. Our wool clip is worth approximately £8,000,000 sterling per annum, brings the highest price per lb. on the average, and is from recent Bradford reports the best in quality of all Australian wools (*vide* Sir John Higgins's latest report on the operations of "Bawra").

The Instructor in Sheep and Wool reports (Appendix C) further new business in connection with the departmental wool scheme, from which it is noted that wool

*In the last Annual Report of the retiring Under Secretary (Mr. E. G. E. Scriven) to the Minister (Hon. W. N. Gillies) for submission to Parliament.

sold under the scheme at the various sales during the year under review realised approximately £6,000.

An outbreak of impaction paralysis of cattle was reported by Mr. Veterinary Surgeon Legg, in certain parts of North Queensland. The prevalence of Osteomalacia (soft-bone) and bone-chewing in the North Coast country—which has been proved to be deficient in minerals, particularly lime salts—has again been noted.

Dr. Arnold Theiler (Director of Veterinary Education and Research, South Africa) has recently published an extensive report on experiments carried out in connection with "Phosphorus in the Live Stock Industry," in which he affords proof that Lamsiekte, closely resembling our impaction paralysis, is indirectly due to phosphorus deficiency. He, however, concludes that the direct cause of the disease is a "ptomaine poisoning" brought about by infection of carcass débris, and expressed the opinion that when a normal supply of phosphorus in soil or vegetation is available cattle do not exhibit a depraved appetite, and decaying carcasses are untouched. As a consequence the disease may be prevented, either by clearing the pastures of all carcass débris or by feeding phosphorus compounds to the cattle. To quote his own words:—"Both are recommended, the first on general hygienic grounds, the second for the reason that the cost of feeding bone-meal is repaid many times over in the improved condition of the cattle, quite irrespective of the insurance provided against the disease."

The bone-meal ration recommended varies, from ½ lb. per head per week for adult oxen and young calves and ¾ lb. for growing stock over 300 lb. in weight, to 2 lb. or more for cows in milk. It should be given, preferably on six days per week or at least tri-weekly, in the form of daily portions.

Details of these experiments are of great importance to stock-owners, and will appear *in extenso* in the "Queensland Agricultural Journal."

A reduction in the number of stock dealt with at the Stock Experiment Stations at Yeerongpilly and Townsville is noted, and this is due to the depression in the cattle industry. The reports of the directors at the stations referred to are contained in Appendices A and B.

As will be noted in the statistics contained in this report, there is a continued increase in the volume of work carried out under "*The Slaughtering Act of* 1898," and regulations. In the metropolitan area approximately 11,000 cattle, 5,000 calves, and 4,000 pigs were slaughtered in excess of the numbers recorded in the previous year, but a decrease of about 80,000 is noticeable in the number of sheep slaughtered. It is anticipated that with the growth of population the Southern capitals will require more Queensland beef, and large consignments of chilled meat are now shipped to Sydney and Melbourne. Recently one of the largest handlers of meat in Australia acquired works in this State, presumably with the primary object of supplying chilled beef to the Southern States.

Analytical Examinations.

Forty samples of viscera and contents were submitted to the Agricultural Chemist for analysis, and in ten cases the presence of poison, principally arsenic, was detected.

Dipping Fluids.

Six hundred and thirty-five samples of dipping fluids were analysed, 503 of which were from Southern and Central Queensland and 132 from North Queensland.

Tick-cleansing Operations.

Helidon Cleansing Area.—During the first half of the year under review, drought conditions were experienced. Cleansing operations were very difficult; regular dippings could not be insisted upon, and little progress was made. The staff were almost wholly occupied in an endeavour to prevent the reinfestation of the clean portions through the agency of straying stock which had been turned out to take

their chance on the roads and prickly-pear scrubs. It is gratifying to note that there were no reinfestations during the year, and that there is a noticeable reduction in the number of tick-infested holdings, which in 1921-22 totalled 498, in 1922-23 were reduced to 288, and during the present year showed a further reduction to 182.

Holdings inspected	3,307
Infested holdings	182
Stock dipped	18,037
Total stock treated	107,680

South Burnett Cleansing Area.—Again cleansing operations were practically at a standstill until December last, and stock were in such low condition that dipping operations could not be resumed for some months after rain fell. The whole area could have been considered clean, had it not been for the introduction of infested stock, inadvertently introduced. Arrangements have been made for the cleansing of the parish of Durong and the area situated between Boondooma and Burrandowan, and an inspector has been temporarily stationed at the former place.

Holdings inspected	276
Infested holdings	21
Stock dipped	22,843
Stock inspected	34,718

Miles-Chinchilla Cleansing Area.—This area is now free from tick infestation, with the possible exception of one or two holdings adjoining the tick-infested country on the northern boundary, which are looked upon as suspected. Inspections have been confined principally to suspected areas, and arrangements were made for the dipping under supervision of stock at Jarah, Cadarga, and Durah North, before their entry into clean country. Approximately 3,500 stock were dipped under these arrangements.

Holdings inspected	180
Holdings infested	nil
Horses inspected	625
Cattle inspected	17,505
Sheep inspected	2,000

Diseases in Stock.

The veterinary staff made 296 visits to various centres in Southern and Central Queensland. Details of the veterinary work in North Queensland are included in Appendix B. Two part-time veterinary surgeons have been appointed, one being stationed at Atherton (North Queensland) and the other at Rockhampton (Central Queensland). The services of these gentlemen have been greatly appreciated by the public, and a number of investigations into stock disease have been carried out on behalf of the Department.

Pleuro-pneumonia contagiosa is still the most prevalent disease, and 37 outbreaks were reported, or seven more than were recorded in the previous year. Veterinary investigations revealed the presence of the following diseases.—Tuberculosis, actinomycosis, redwater, pneumonia in calves, mineral and vegetable poisoning, contagious abortion, ringworm in pigs, mammitis, osteomalacia, strangles, parasitic pneumonia, malignant growths, tetanus, and stomach worms.

In October, Inspector Holmes, of Hughenden, having visited a certain property in his district, reported that a wool-classer advised the discovery of some dead wool on several sheep, caused assumedly by some insect pest. The sheep were otherwise healthy and only a small portion of the wool was affected. Samples of the diseased wool were forwarded for examination, and the Government Entomologist, to whom they were submitted, reported that he found these samples harboured immense numbers of the adults and the eggs of a special sheep-louse (*Linognathus ovillus*), which were dead on discovery. This particular louse on sheep is of much more significance than is the ordinary "biting sheep-louse," in that they extract blood and cause the wool to die. So far this is the only case recorded in Queensland, but it has been found on rare occasions in New Zealand, New South Wales, and South Australia. The property was quarantined, and in the absence of a dip on the property

the sheep were jet-sprayed. After close inspection in March last by the district inspector, no further cases could be detected, and, as this was confirmed by the owner of the property and his wool-classer after careful search, the quarantine was subsequently removed.

Tuberculosis.—During the year the tuberculin test was applied to 429 animals, as compared with 634 in 1923, and 380 in 1922. Twenty animals reacted to the test, and were destroyed, whilst 19 gave doubtful reactions, and were noted for a subsequent re-test. Of the animals tested, 59 were owned by the Government and 370 privately owned.

Pleuro-Pneumonia Contagiosa.—The following tabulated list shows the number of outbreaks in the various stock districts:—

District.	1923.						1924.						Total.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
Maryborough	1	..	..	1	..	..	..	..	..	..	..	2	4
Cunnamulla	1	..	..	1	..	..	..	..	..	1	..	..	3
Rockhampton	..	1	..	1	..	..	..	..	..	1	..	1	4
Brisbane	..	2	..	..	1	..	1	..	1	..	..	1	6
Springsure	..	1	..	..	..	..	..	..	..	..	..	..	1
Charleville	..	..	..	1	..	..	..	..	..	2	1	..	4
Longreach	..	..	..	1	..	..	..	..	..	..	..	..	1
Townsville	..	..	..	1	..	..	..	..	1	..	..	..	2
Gladstone	..	..	..	..	..	..	1	1	..	..	..	3	5
Roma	..	..	..	..	..	..	..	..	..	1	..	..	1
Normanton	..	..	..	..	..	..	..	..	..	..	2	..	2
Cloncurry	..	..	..	..	..	..	..	..	..	1	..	2	3
Barcaldine	..	..	..	..	..	..	..	..	..	..	1	..	1
	2	4	..	6	1	..	2	1	2	6	4	9	37
Total number of outbreaks in Queensland													37

Tobacco-bush Poisoning.—Inspector Gunne, of Cunnamulla, reported that in October last a mob of 900 cattle were travelled from the Bollon district to the Thargomindah district, and as the stock route was in a very bad condition, owing to drought, the stock had been three days practically without food, prior to arrival at a sandhill where the tobacco-bush was plentiful. As the result of eating this bush, 161 animals died, and many others were affected.

Blindness in Sheep.—Cases were reported in the Clermont district, and the owner submitted specimens of *Flaveria australasica* to the Government Botanist, who identified the plant, but expressed the opinion that it was not injurious to stock. This plant or a closely allied weed had, however, previously been suspected as the cause of blindness in sheep in the Richmond district. He, therefore, advised feeding experiments, as a knowledge of the plant's properties, whether injurious or otherwise, was of importance. These feeding experiments were carried out with four sheep, one being kept as a control. At least 2 lb. of the plant were given daily to each of the three sheep for twenty-three days, when it was discontinued because the green bush was unprocurable. No evidence of eye-trouble in the sheep was noted, and no inconvenience to the sheep was caused, except in the case of one animal which showed a slight diarrhœa about the seventh day after the initiation of the experiment.

Stock Sales.

The following are the particulars of stock sold through the Newmarket saleyards at Brisbane during the year:—

Number.		Average prices.		
		£	*s.*	*d.*
Cattle—102,228	Bullocks	6	10	0
	Cows	3	2	6
	Calves	1	5	6
Sheep—294,185	Sheep	1	8	9
	Lambs	1	3	0
Pigs—6,380	Porkers	2	5	0
	Stores	1	10	0
	Weaners	0	13	0

Quarantine Act.

Particulars of quarantined animals:—

	Horses.	Dogs.	Mules.	Monkeys.
Brisbane	10	3	..	..
Townsville	4	..	1	3
	14	3	1	3

Details of the number of hides and skins imported for the year were as follows:—

Calf-skins	10,063
Cattle-hides	2,288
Goat-skins	41,710

Upon arrival these hides and skins were disinfected under supervision, and the necessary precautions taken in accordance with the Quarantine Regulations.

The following table shows stock movements for the various stock districts during the period under review:—

District.	Entered District.			Removed from District.			Movements in District.			Stock Dipped.		Stock Sprayed.	
	Horses.	Cattle.	Sheep.	Horses	Cattle.	Sheep.	Horses.	Cattle.	She p.	Hors. s.	Cattle.	Horses.	Cattle.
Barcaldine ..	1,225	14,848	159,527	2,127	23,542	430,284	2,411	5,523	491,813	30	7,780	..	..
Bowen ..	4,345	13,084	9,145	3,840	32,632	..	13,618	74,702	6,880	74	1,217	..	..
Brisbane ..	3,069	187,454	283,829	2,895	29,383	69,395	6,242	127,283	65,088	466	56,619	922	216
Cairns ..	599	10,929	4,629	1,117	11,459	4	3,677	19,817	995	43	27,470	14	3
Charleville ..	2,448	52,217	385,522	10,944	118,286	775,330	8,441	81,201	668,253	..	..	..	..
Clermont ..	230	2,512	49,107	1,459	42,098	262,357	3,521	16,120	90,851	1,133	16,668	33	..
Cloncurry ..	4,416	96,281	344,587	7,550	146,168	539,596	9,310	86,422	816,205	761	116,405	..	2,631
Cunnamulla ..	2,508	41,518	178,954	5,919	108,982	558,628	8,441	43,878	600,056	..	..	..	..
Gladstone ..	561	21,537	1,001	1,278	41,668	5	2,712	17,296	..	9	5,733	902	..
Helidon ..	717	9,340	4,125	1,190	12,824	1,874	706	29,750	20	526	29,053	52	62
Hughenden ..	2,019	24,728	318,786	4,964	21,945	747,103	6,181	14,812	410,808	74	11,169	602	89
Longreach ..	1,883	21,541	177,157	4,636	28,863	740,951	10,552	11,352	1,987,952	140	5,095	..	..
Maryborough, .	2,560	26,158	17,693	3,860	101,062	3,742	2,959	88,639	27,588	615	62,238	78	30
Normanton ..	230	3,295	5,711	1,251	29,359	..	1,173	4,495	..	..	27,055	..	..
Rockhampton ..	1,975	13,645	52,585	2,646	71,901	33,208	7,566	129,433	14,055	128	2,242	75	46
Roma ..	1,334	18,651	104,344	6,317	115,465	355,846	9,266	111,669	547,389	415	21,051	310	2,355
South Burnett	1,067	8,971	31,598	2,395	31,056	28,909	4,466	111,639	3,085	390	25,880	..	55
Springsure ..	1,794	10,704	112,799	6,542	69,845	397,763	2,131	44,854	140,719	1,129	26,797	279	47
Tallebudgera ..	626	1,008	935	600	2,021	2	185	10,479	..	26	987	38	..
Toowoomba ..	5,449	71,092	317,768	12,034	118,062	313,491	20,465	269,486	655,071	1,286	67,360	363	21
Townsville ..	849	63,905	30,413	1,728	7,619	30,452	11,883	32,341	1,601	6	1,206	62	4
Warwick ..	3,359	43,184	188,360	3,298	36,690	182,107	9,187	165,468	540,690	5	999	4	..
Winton ..	1,250	14,097	116,265	3,227	22,851	324,413	1,321	14,839	251,950	..	9,215	..	..

The Slaughtering Act of 1898.

A comparative increase in the volume of stock slaughtered, and which corresponds to the increase in population, was noted except in the case of pigs, where the figures showed a decrease in respect of operations outside the metropolitan area.

Although the number of pigs slaughtered in the metropolitan area is about 4,000 greater than last year, the numbers operated upon at the various bacon factories show a decrease of 43,000 on the figures for the previous year.

Returns for the metropolitan area are as follows:—

	1922-23.	1923-24.
Cattle	59,377	70,884
Calves	25,248	30,495
Sheep	320,860	240,172
Pigs	15,273	19,457

The following are comparative returns of permanent officers of the Department at centres other than the metropolitan area, and which are shown in a later tabulated statement:—

	1922-23.	1923-24.
Bullocks	106,589	100,490
Cows	33,750	67,793
Calves	40,419	35,315
Sheep	461,459	382,923
Pigs	42,549	39,649

Returns are also received from police officers of stock slaughtered at 175 country centres, and which show the following comparative totals:—

	1922-23.	1923-24.
Bullocks	63,135	60,753
Cows	31,358	43,301
Calves	5,079	2,204
Sheep	91,577	60,923
Pigs	15,360	14,127

During the year 9,838 carcasses of veal and 5,140 carcasses of pork were submitted for examination to the Central Depôt, established at the Department.

The construction and maintenance of the Brisbane metropolitan slaughter-yards can be considered satisfactory under present conditions. The provision of at least a standard minimum-sized slaughter-house has been enforced, which must be erected in conformity with the plans provided. The floors are constructed of concrete with drainage facilities, and the provision of an adequate supply of water for cleansing purposes is insisted upon. A comparison of existing conditions from a structural and hygienic standpoint compares more than favourably with those which existed some few years ago. Attention has been repeatedly drawn in previous reports to the fact that the inspection with the present available staff of officers at private slaughter-yards, of which there are 41 in the metropolitan area, cannot be as thorough as that which could be provided at abattoirs.

The senior slaughtering inspector reports having visited the following centres:—Ipswich, Laidley, Gatton, Grantham, Helidon, Toowoomba, Cambooya, Warwick, Killarney, Allora, Stanthorpe, Ballandean, Applethorpe, Wallangarra, Warra, Jandowae, Dalby, Roma, Cunnamulla, Morven, Acland, Wutul, Brymeroo, Peranga, Nambour, Woombye, Palmwoods, Gympie, Kin Kin, Yandina, Maryborough, Rockhampton, Kilkivan, Goomeri, Manumbar, Esk, Lowood, Maleny, Coolangatta, Gayndah, Eidsvold, Mundubbera. Details of the numbers of minimum-sized slaughter-houses and shops completed during the year or in progress of erection in various parts of the State are as follow:—

Slaughter-houses.

Completed	42
Remodelled	1
Under construction	9

Shops.

Completed	34
Remodelled	6
Under construction	11

It is reported that many of the country yards are not maintained in a satisfactory manner, owing to the neglect of the owners in the matter of sanitation and cleanliness. In these cases, frequent service of orders to rectify irregularities had to be resorted to. The condition generally of country shops is fairly satisfactory, but continual supervision is essential.

The Darling Downs Co-operative Bacon Factory was destroyed by fire in the early part of the year, which resulted in considerable disorganisation of the industry. New buildings have, however, been erected, and operations were suspended for only a limited period. A new bacon factory has been erected at Mareeba, North Queensland, and it is understood that the volume of pigs submitted for slaughter has rendered additions to the original building necessary to meet the demand.

The following tabulated list shows stock slaughtered and condemned at Brisbane, Gympie, Maryborough, Bundaberg, Rockhampton, Mount Morgan, Mackay, Townsville, Charters Towers, Cairns, Ipswich, Toowoomba, Warwick, Charleville, Gladstone, Bowen, Cloncurry, Clermont, Barcaldine, Springsure, Cunnamulla, Dalby, Normanton, Roma, Mareeba, Gayndah, and Longreach:—

Description of Stock.	Number of Stock Slaughtered.	Carcasses and Portions Condemned.	Disease.	Percentage.
Bullocks ..	100,490 ..	127 carcasses ..	Tuberculosis ..	·126
		156 forequarters	Tuberculosis ..	·077
		19 hindquarters	Tuberculosis ..	·009
		340 heads ..	Tuberculosis ..	·338
		7 carcasses ..	Bruised	·006
		40 forequarters	Bruised	·019
		4 hindquarters	Bruised	·0019
		3 hindquarters	Abscesses	·0014
		31 heads ..	Abscesses	·030
		321 heads ..	Actinomycosis ..	·319
		30 carcasses ..	Emaciation	·029
		7 carcasses ..	Pink nose	·006
		7 carcasses ..	Pleuro-pneumonia ..	·006
		32 forequarters	Pleuro-pneumonia ..	·015
		3 carcasses ..	Redwater	·002
		3 carcasses ..	Putrefaction ..	·002
		12 forequarters	Putrefaction ..	·005
		2 carcasses ..	Jaundice	·0019
		1 carcass ..	Septicæmia	·0009
		6 forequarters	Septic wounds ..	·002
		1 carcass ..	Gangrene	·0009
Cows ..	67,793 ..	235 carcasses ..	Tuberculosis ..	·346
		170 forequarters	Tuberculosis ..	·125
		19 hindquarters	Tuberculosis ..	·013
		172 heads ..	Tuberculosis ..	·253
		127 heads ..	Actinomycosis ..	·187
		17 carcasses ..	Bruised	·025
		70 forequarters	Bruised	·051
		1 hindquarter ..	Bruised	·0007
		83 carcasses ..	Emaciation	·122
		2 carcasses ..	Malignant growth ..	·002
		9 carcasses ..	Redwater	·013
		9 forequarters	Pleuro-pneumonia ..	·006
		1 carcass ..	Fatty degeneration ..	·001
		3 carcasses ..	Putrefaction ..	·004
		1 carcass ..	Septic metritis ..	·001
		4 forequarters	Abscesses	·0029
		3 hindquarters	Abscesses	·0022
		21 heads ..	Abscesses	·030
		2 carcasses ..	Septicæmia	·002
		1 carcass ..	Jaundice	·001
		5 forequarters	Septic wound ..	·003
		1 hindquarter ..	Gangrene	·0007
		4 carcasses ..	Advanced pregnancy	·005
		1 carcass ..	Peritonitis	·001

Description of Stock.	Number of Stock Slaughtered.	Carcasses and Portions Condemned.	Disease.	Percentage.
Calves ..	35,315 ..	1,009 carcasses ..	Immature	2·857
		5 carcasses ..	Poverty	·014
		1 carcass ..	Bruised	·002
		5 forequarters	Bruised	·006
		1 carcass ..	Tuberculosis ..	·002
Pigs ..	203,877 ..	1,445 carcasses ..	Tuberculosis ..	·708
		12,688 heads ..	Tuberculosis ..	6·223
		2 carcasses ..	Abscesses	·0009
		206 heads ..	Abscesses	·101
		15 carcasses ..	Emaciation	·007
		10 carcasses ..	Putrefaction ..	·004
		2 carcasses ..	Pneumonia	·0009
		2 carcasses ..	Septicæmia	·0009
		3 carcasses ..	Skin disease	·001
		1 carcass ..	Kidney worms ..	·0004
		4 forequarters	Pleurisy	·0009
		1 forequarter ..	Gangrene	·0002
Sheep ..	382,923 ..	81 carcasses ..	Emaciation	·021
		10 carcasses ..	Bruised	·002
		12 carcasses ..	Putrefaction ..	·003
		5 carcasses ..	Poverty	·001
		2 carcasses ..	Pseudo-tuberculosis	·0005
		1 carcass ..	Jaundice	·0002

The following is a tabulated list showing the particulars of pigs slaughtered and condemned at bacon factories:—

Number of Pigs Slaughtered.	Carcasses and Portions Condemned.	Disease.	Percentage.
164,228 ..	1,228 carcasses	Tuberculosis	·747
	1 forequarter	Gangrene	·0003
	10,990 heads	Tuberculosis	6·691
	22 heads	Abscesses	·013

CONDITIONS IN THE NORTH.

The Government Veterinary Surgeon at Townsville (Mr. John Legg, B.Sc., B.V.Sc., M.R.C.V.S.) reports:—

The first half of the year under review was marked by exceedingly dry weather conditions everywhere in the northern half of the State. Actually, from a rainfall point of view, it was the driest period in the history of this portion of the State. Many stock died from starvation and want of water. The weather broke in February last, and since then there has been an abundance of grass everywhere; stock quickly recovered, and ever since have been in the best of condition.

Stock Experiment Station.

A minimum amount of work has been performed at the Stock Experiment Station, owing to the depression in the cattle industry. Very few bulls are being imported from southern parts to the cattle stations in the North, and, consequently, there have been very few animals arriving here for vaccination purposes. Only six head of cattle have been received during the period under review; and these have all been satisfactorily vaccinated, with no losses.

The work performed by the chemist is found in the Appendix attached.

The Gilbert River Horse Disease.—A brief description of this disease has been already reported and there remains little to be said here. The disease is in reality a

parenchymatous hepatitis of the liver associated with hæmorrhage and degeneration of the liver cells. There is also an increase in the fibrous tissue of the organ and a tendency to cirrhosis. There is usually marked distension and engorgement of the stomach. The geographical and seasonal distribution in Queensland, symptomatology and lesions of the disease, are briefly described in the "Queensland Agricultural Journal" for June.

The cause is unknown, but the condition appears to be a toxæmia causing degeneration and death of the liver cells. The condition produced is like that found in some other countries, where the cause can be definitely assigned to the ingestion of certain plants, and from analogy one would be inclined to think a somewhat similar cause was operating in Queensland.

Hæmonchus contortus (Sheep Stomach Worm) in calves.—In January last a report was received that several calves had died at a farm about 10 miles from Townsville, on the Ross River. An investigation undertaken by the stock inspector, Mr. J. A. Rheuben, of Townsville, revealed the fact that these animals were heavily infested in the fourth stomach by a nematode parasite, which was kindly examined by Dr. G. Sweet, of Melbourne, and probed to be *Hæmonchus contortus*, the common stomach worm of sheep of Central and Southern Queensland.

The writer, who visited the area, was unable at the time to find any sick animals; on the day the visit was made the cattle were in the bush and could not all be mustered. But there is little doubt that the parasitic infestation was the cause of death. Since the above cases occurred a *post mortem* on a calf about 15 miles from Townsville, and in another direction altogether, and which was suffering from pleuro-pneumonia, also revealed many parasites of the same kind in the fourth stomach.

In 1922, two reports were received at Townsville concerning the deaths of calves in two different coastal areas—one at the Murray River, about 100 miles north of Townsville; the other at Proserpine, about 150 miles south of Townsville—and in both cases it was found that a heavy infestation of the fourth stomach by nematode worms was present, and there is little doubt that this was the cause of death. An examination of these specimens, which were kept at the time, has revealed the fact that they are also *Hæmonchus contortus*.

There are one or two points of great interest concerning these cases. In the first place, the death of the calves at Townsville in January last took place at the latter end of one of the longest and severest droughts known. This is very remarkable when it is remembered that moisture is essential for the development of the parasite through certain parts of the larval stages which it passes on the ground. The second point of interest is that the infection was heavy enough to cause death in certain animals. The calf is not a common host of the sheep stomach worm. Sheep, of course, when placed on infected areas become rapidly infected, and losses may be serious, but cattle on the same areas do not seem to be affected at all. Further, the areas from which all the above cases came from have never been grazed over by sheep at any time.

The above is of interest especially as the keeping of sheep in coastal areas is being advocated at the present time in certain quarters.

Impaction paralysis of cattle.—In my last annual report I drew attention to a condition which had appeared in certain areas in the Charters Towers district of North Queensland, and which appeared to be closely similar to the impaction paralysis seen in cattle in some of the Southern States.

It was thought that the condition might have been produced as a result of ingestion of dead animal matter, especially bones and decomposing parts of carcasses left lying about the run. Osteomalacia is common among the cattle running on infected areas, and owing to lack of minerals in the soil, cattle are frequently found chewing bones and parts of decomposing carcasses of dead cattle. Acting along these lines, parts of the affected areas were completely cleared of bones, &c., and lime supplied in troughs. As a result there was a considerable falling-off in the number of cases occurring, the number of animals affected dropping to about 10 per cent. of what had originally occurred. This seemed significant, but it is really too early to judge yet whether the diminution in the number of cases has been due to a clearing of the pastures, or whether some other as yet unknown factor is operating to bring about such reduction. What is important to remember is that although the areas seem to be entirely free of bones, &c., and the disease seems to have largely disappeared, yet it has not already done so, and on more than one occasion there have been half a dozen deaths following each other in rapid succession. It might be that in such cases an old carcass missed by those burning off—and this is easy in large areas of scrub country—has been discovered by a few cattle and infection followed, or, on the other hand, infection may be coming from an entirely different source. The cattle are being constantly visited and kept under observation.

Osteomalacia in cattle.—This disease, common enough in many other parts of Australia, occurred recently in several areas in North Queensland. It was practically prevalent round about the end of the recent drought. Drought conditions naturally accentuate the malady, and the recent wet season has resulted in an almost complete disappearance of the trouble. Cattle which were badly affected in November and December last, and which could hardly move themselves to water, were found in April to be completely free from the disease.

The trouble is nearly always seen in cows, rarely in young stock or male animals, the reason being the obvious one that the cow is nearly always either lactating or else carrying a calf *in utero*, very often both. This leads to a big drain of the calcium salts from her system, with the resultant bone-softening.

Dicrofilaria immitis in dogs.—This condition has been noticed quite commonly in dogs recently in North Queensland. It is produced as a result of infection with *Dicrofilaria immitis*. The parasite is found usually in the right side of the heart and the large vessels leading into it. Owing to the large number of parasites found together, there is mechanical interference with the flow of blood, with resultant heart weakness. Congestion of the liver, dropsy, fainting fits, and general lassitude are the symptoms usually produced, these becoming gradually aggravated as time goes on, and result in the death of the animal usually in a comatose condition.

Tumour formation in the region of the orbit of the horse.—During the last couple of years a number of cases of tumour formation in the region of the orbit of the horse have been noticed. These have mostly been cases which have been submitted for surgical interference, and in every such case there has been implication of the *Membrana nictotans*. In several cases other parts of the orbit have been involved, one case involving both eyelids and one the cornea and part of the sclerotic. One case, as well as involving the orbit, also involved a small area on the cheek, this latter evidently being due to metastatis.

In every one of these cases except one the growth was submitted to histological examination, with the result that the examination showed either a papilloma or a carcinoma. Both these types of tumours are built up of epithelium, the difference between the first and second being that one is simple and the other malignant. In the case of the papilloma the essential feature of the growth is a great heaping up of surface epithelium supported by a connective tissue basis, while in the carcinoma the epithelium has commenced to burrow and infiltrate surrounding tissues, and metastasis is common. In examining these sections it was found that the smaller tumours were papilloma and the larger were carcinoma, and it seems likely that the former represented a new growth of epithelial tissue which had not yet taken on malignant characters.

All of these tumours were mostly of a slow-growing type, except one which on removal recurred within a few weeks and, growing rapidly, soon destroyed the bones in the region of the orbit, and another which had already involved the upper and lower eyelids, as well as the whole of the *Membrana nictitans*, and was considered inoperable. One other growth recurred at the inner canthus after removal and was again removed, apparently successfully, as there has been no recurrence within the last eighteen months, although the animal has been kept under close observation.

Several of the tumours when removed showed a tendency to have undergone degeneration, as small broken-down areas were seen with the microscope. In these areas there was no cell differentiation and the staining was irregular, the cells here evidently being dead and breaking down into a homogeneous mass.

The following is brief résumé of the cases:—

No. 1.—Draught stallion, four years. Growth near eye on outer edge of *Membrana nictitans*. Growth about size of small pea and protruding over eye. Removed under local anæsthesia. Section showed papilloma. There was no tendency on the part of the epithelial cells to break away and infiltrate the deeper tissues.

No. 2.—Aged pony. Growth flattened and triangular in shape about 2 in. each way. Growing outwards over eye from inner canthus, and owing to continued irritation there was an opacity of the cornea and marked lachrymation. Section showed squamous-celled carcinoma.

No. 3.—Aged gelding. Tumour size of small pea on *Membrana nictitans* off eye. Section shows the tumour to be an epithelioma.

No. 4.—Aged gelding. Growth size of small marble on outer edge of *Membrana nictitans*. This growth had been rapidly increasing in size from the first time it had been noticed. Unfortunately, no material from this case was kept for section purposes. It is included here because from its situation and appearance it was in all probability similar to many others mentioned.

No. 5.—Aged gelding. Tumour large, flattened, about 2 in. each way. Its protrusion over the eye had caused a marked lachrymation owing to mechanical irritation. Section showed the tumour to be a typical epithelioma.

No. 6.—This was the same horse as No. 3, being a recurrence in the same situation six months later. It was removed again and has not recurred since.

No. 7.—Aged gelding. Tumour about size of walnut off eye. Easily removed and showed small areas of degeneration. Microscopically the section showed a squamous-celled carcinoma.

No. 8.—Aged gelding. Two small growths about size of small marbles on *Membrana nictitans*. Microscopically the tumour was shown to be carcinomatous.

No. 9.—Two-year-old mare. Growth large, size of orange, and diffuse, involving whole of near orbital cavity. Small growth size of pea, involving *Membrana nictitans* off eye. Case considered inoperable. This tumour was obviously malignant. No material was obtained for section purposes.

No. 10.—Aged gelding. Growth involving sclerotic and cornea about size of half-a-crown and flattened. Two small tumours in upper eyelid about size of peas and several small growths on the *Membrana nictitans*. Microscopically the section showed an epithelioma.

No. 11.—Tumour off eye size of small orange at inner canthus and involving whole of *Membrana nictitans;* smaller growth about size of marble involving whole length of lower lid and about half length of upper lid. Growth dissected out and removed. In this case there was recurrence, the tumour attaining size of small melon seven weeks after operation and involving whole of orbital bones. Destroyed 17th March, 1924. Section of growth showed typical epithelioma with cell-nests.

Contagious abortion.—Fortunately, there seems to be but little of this trouble among the dairy herds of the North, at least little is heard of it if it does exist. It seems likely that the disease is present, however, when it is considered that many of herds here have been built up within the last few years by the importation of cattle from the South, where the disease is not uncommon.

On more than one occasion, however, several cases of abortion have been reported following one another in rapid succession in pastoral herds. Cattle can be tested by the agglutination test. This is a comparatively simple test, and can fairly rapidly be applied to a large number of animals. Unfortunately, we have not been able to obtain blood from the infected herds, but tests have been carried out on a small number of cows around Townsville, but in no case has a positive reaction been obtained.

Material to carry out the tests, such as cultures of the bacillus of "Bang" and positive sera for control purposes, have been supplied to us by Dr. Seddon, of the New South Wales Agricultural Department. The blood for testing is usually obtained in ½-oz. bottles by opening vessels in the tail. Standing in ice for twenty-four hours allows one to obtain all the serum that is required for testing purposes.

Appendix.

Chemical work during the year consisted of routine analyses of dipping fluid, of which 132 samples were submitted for analysis. In addition, thirty-one samples were sent to the Agricultural Chemist, Brisbane, during the months December, 1923, to May, 1924:—

Arsenious acid (As_2O_3) per 400 gallons.

2·0%	contained less than 2 lb.
9·8%	contained from 2 to 4 lb.
10·2%	contained from 4 to 5 lb.
16·2%	contained from 5 to 6 lb.
16·2%	contained from 6 to 7 lb.
15·9%	contained from 7 to 8 lb.
14·8%	contained from 8 to 9 lb.
5·1%	contained from 9 to 10 lb.
9·8%	contained from 10 lb. and over

Arsenic acid (As_2O_3) per 400 gallons.

9·8%	contained 3 lb. and over
2·6%	contained from 2 to 3 lb.
2·4%	contained from 1 to 2 lb.
2·2%	contained under 0·5 lb.
83·0%	were free

Other analyses were periodical tests of the departmental dip and spray. In addition, ten pints of standard iodine were despatched.

REPORT OF THE GOVERNMENT BACTERIOLOGIST.

The Government Bacteriologist (Mr. C. J. Pound) reports:—

Fees and Moneys Received.

The following is the total amount of money received for work performed, bacteriological examination of samples of water, milk, and various morbid specimens, and the supply of blackleg vaccine, pleuro virus, and other laboratory products:—

	£	s.	d.
Immunisation of stud animals	121	12	0
Bleeders supplied	250	0	0
Blood for inoculation	61	19	0
Blackleg vaccine	51	8	0
Pleuro virus	8	4	0
Lactic cultures	41	17	0
Stalling and feeding of cattle during experiments for Institute of Science and Industry	125	0	0
Mammitis vaccine	28	10	0
	£652	10	0

Specimens Submitted for Bacteriological and Other Examination.

Samples of water from butter and cheese factories	27
Pickling brine	6
Milk for tuberculosis	4
Milk for contagious mammitis	49
Cream for bacterial contamination	5
Blood for contagious abortion	421
Pus for tubercle or actinomycosis	2
Blood films for tick fever organisms	19
Pleuro virus for contaminating organisms	8
Pathological specimens	48
Plates exposed in dairy factories for air contamination	7
Butter, for mould fungi, &c.	4
Miscellaneous	9

Immunisation of Stud Cattle for Tick Fever.

As anticipated, a comparatively small number of stud animals (31) was received at the station for tick fever inoculation. The majority of these animals were Herefords, but the milking strains were also represented, as will be seen from the following table:—

Beef Shorthorns—Bull	1
Milking Shorthorns—Bulls	5
Cows	2
Herefords—Bulls	19
Friesians—Bulls	2
Guernsey—Bull	1
Devon—Bull	1
Bulls	29
Cows	2
Total animals	31

Each of these animals gave a satisfactory reaction to the inoculation, and there were no deaths recorded here. However, one Illawarra Milking Shorthorn cow succumbed some little time after leaving Yeerongpilly.

The demand for tested "bleeders" prepared at Yeerongpilly continues, and from reports received of the twenty-five animals supplied this year they have proved uniformly satisfactory. The large number of blood-supply animals, prepared by the Department and now in possession of private owners, accounts for the decreasing demand for blood for inoculating purposes. In special cases where stockowners do not possess the necessary knowledge, the work of inoculation is performed by an officer of the Department.

The practice of inoculating cattle when *en route* from clean country to ticky pastures, notwithstanding advice to the contrary, is still carried out by some stockowners. This practice is at times successful, but is haphazard and very risky, and those stockowners persisting in this method of handling cattle will sooner or later most assuredly lose some of their cattle from natural tick fever. Much of this risk can be and actually is avoided by many stockowners who adopt the recommendation of inoculating their cattle and allowing them to recover before exposing them to tick infestation.

Detention of Tick Fever Organisms in the Blood of Long-recovered Animals.

It has sometimes happened that a "bleeder" has been purchased whose blood was not required for a period of a year or longer, and the owner has had some doubt whether the blood would produce a satisfactory result when injected into susceptible cattle, which in some districts are not readily procurable.

In a previous report I pointed out that it was possible to demonstrate the presence of pirosomes in carefully stained preparations of blood from animals long recovered from tick fever. During past years further opportunities have arisen to examine the blood of animals which have either been inoculated or have recovered from tick fever. In several cases the organisms were readily detected, while in others the organisms could only be detected after long and careful search. The organisms found had a tendency to the rod and ring form, while in others there were present the typical pear-shaped bodies. Even though in some cases it is necessary to make a long and careful microscopical search, considerable time was saved by the method.

Tick-dipping Investigations.

These experiments, in conjunction with New South Wales and the Federal Institute of Science and Industry, have been continued. In view of the fact that some of the coastal districts of Queensland and New South Wales are subject, during the summer months, to frequent heavy showers of rain, the question has naturally been asked whether such conditions would materially interfere with the progress of tick eradication work. The results of our experiments practically demonstrate that, if tick-infested animals encounter heavy rain within two hours of being treated, the tick-killing properties of the fluid are greatly reduced.

In the previous report it was shown that in the case of tick-infested animals sprayed twice with freshly-prepared solutions containing 5 lb. of arsenious oxide per 400 gallons, with a four-day interval between each dipping, a number of ticks survived which laid fertile eggs. In more recent experiments a number of tick-infested cattle were treated with 4 lb., 5 lb., and 8 lb. of arsenious oxide per 400 gallons, at two and three days' interval. The results prove that the above strengths were ineffective, for some ticks survived which laid fertile eggs. Simultaneously, animals were sprayed twice with 8 lb. of arsenious oxide per 400 gallons with intervals of two and three days, with the result that all the ticks were killed.

Further experiments are projected which will no doubt furnish valuable scientific information, but we are already possessed of sufficient data to commence eradication work with every confidence. To ensure success, this work in the early stage should be on a small scale, but when once the practicability of the method is demonstrated it will prove an incentive to stockowners to co-operate and seriously face the problem. The work of eradication is based on very simple principles, nevertheless propaganda will be necessary in order that those persons directly interested may thoroughly understand the method.

For example, usually sixteen dippings are required to completely eradicate the ticks from a property, but after about the fifth dipping it is a difficult matter to find ticks on the animals. In the absence of full knowledge on the subject the owner would naturally conclude that the cleaning up is now complete and is inclined to desist from further treatment of his cattle, being unaware that larval ticks still exist on the ground which have not got on to the cattle, but have not yet succumbed to starvation; in fact, it has been repeatedly demonstrated that some of the larval ticks can live

quite apart from their hosts, without food or moisture, for six months without dying of starvation.

Therefore it is imperative, in order to eradicate the ticks from the cattle and the ground, dipping must be continued fortnightly for at least eight months. It is also of paramount importance that in order to maintain a margin of safety the dipping fluid employed must be maintained at standard strength.

Blackleg.

Owing to the continued depression in stock values, the demand for blackleg vaccine has not been so great as in former years, but 770 doses have been supplied, but in no instance have reports other than satisfactory been received as regards its reliability. Protection is conferred by two injections of vaccine, and the labour is well repaid, as by this double method no losses whatever take place as a result of the injections, and, further, the subsequent losses are practically nil.

Pleuro Virus.

Pleuro virus for preventive inoculation has been supplied to the following districts:—Lowmead, Cunnamulla, Rockhampton, Charleville, Wondai, Morven, Brisbane, Killarney, Eidsvold, Beaudesert, Murgon, Quilpie, Canungra, Woodhill, Mitchell, Injune, Bowen, Many Peaks, Gatton, Chinchilla, Jackson, Augathella, Taroom, Ipswich, Kilcoy, Boonah, Toogoolawah, Esk, Warra, Thallon, Kingaroy, Brooklands, Toowoomba, Kilkivan, Fernvale, Helidon, Tungamull, Macalister, Miriam Vale, Longreach, Rosalie Plains, Greenmount, Duaringa, Burleigh, Crow's Nest, Linville, Yelarbon. Many of the supplies of natural virus received at the laboratory were, on microscopical and bacteriological examination, found to contain micro-organisms likely to bring about sepsis (bad tails) and were therefore condemned.

Contagious Abortion.

Four hundred and twenty-one specimens of blood from cases of suspected contagious abortion were received for the precipitation test, positive results being obtained in 114 cases. The majority of these specimens from dairy stock were submitted from one institution, and in order to determine whether the precaution taken was proving effective in checking the further progress of the disease, and also to ascertain whether any animals had recovered, repeated examinations were made at intervals of three months. The subsequent examinations confirm in the majority of cases the positive and negative results of the original tests.

As a result of carrying out this particular work for the past three years, our experience has proved that the agglutination test is so thoroughly reliable that when all details are carefully considered a positive result is sure evidence that an animal is or has been infected with the bacillus *abortus*, while a negative result indicates non-infection.

Lectures.

Lectures and demonstrations on the characteristics of good and bad food (such as milk, meat, fish, milk products, vegetables, fruit, and canned goods) were given at the Central Technical College, to students who were preparing for the College certificate and for the examination of the Royal Sanitary Institute, London.

Lectures on various subjects, including ticks and tick fever, tick eradication, tuberculosis, contagious mammitis, contagious abortion, &c., were delivered at various country centres under the auspices of the respective local producers' associations.

Contagious Mammitis.

This disease is somewhat prevalent in the dairy herds in Southern Queensland, and an autogenous vaccine is prepared in the laboratory and has been largely availed of for curative and preventive treatment. Provided it is used in the early stages of the disease, two injections of vaccine are usually sufficient to effect a cure, but in longstanding cases it is sometimes found necessary to continue the treatment. While there is every reason to be satisfied with the results obtained with the vaccine when employed for curative treatment, for obvious reasons it is difficult to obtain exact information as to the value of the vaccine when used as a preventive.

HANDLING AND MARKETING OF EGGS.

P. RUMBALL, Poultry Instructor.

The most profitable methods of handling and marketing of eggs is frequently neglected by the farmer. It is a subject that is of obviously great importance to those engaged in the egg trade, to the farmer, and also to the consumer. The loss due to inferior quality eggs in Queensland is hard to estimate, but it must be enormous. It must be continually borne in mind that eggs are bought on quality, and if the farmer markets eggs that are poor in this respect he has no redress, whereas if the quality of his eggs are A1 he may, if not satisfied with the prices obtained by one agent, try another. The conditions causing the lowering of the quality of the egg are in the main preventable, and are largely in the hands of the producer. Paper quotations to-day are 1s. 2d. to 1s. 9d. per dozen, a difference of 33⅓ per cent. in favour of the first-class article.

Unfertile Eggs.

The unfertile egg is the only egg that may be handled with confidence, and accordingly it is the egg that should be produced. The presence of the male bird in the flock causes the fertilisation of the majority of the eggs laid which is the principal cause of the inferior egg. The fertile egg contains the germ of life, and is liable to commence incubation when heat is applied by broody hens, sun rays, either in the yard, store, or while being conveyed to market. Knowing this, then the remedy is to dispose of surplus male birds and to yard separately those that are required for breeding purposes.

Flavour of Eggs.

It is generally conceded that eggs that are perfectly fresh and are the produce of well-fed hens are of finest flavour, but I have eaten "chilled eggs"—*i.e.*, eggs that have been kept in cold storage, and were six months old—and I could not detect by taste any difference from the new-laid egg; the reason for this being that the eggs had been properly handled, and were from birds that had been properly fed. The flavour of the egg may be affected by the feeding. The New York State Experimental Station has studied the effect of different foods upon the flavour of eggs, and found that when birds were fed largely upon onions, the flavour was very pronounced. Offals will also affect flavour. What is required is good wholesome food with fresh clean water. An egg contains about 65 per cent. of water. The flavour is also affected by odours given off in the store, and consequently eggs should not be stored with onions, fruit, kerosene, or other odorous commodities.

Colour and Quality of Egg Shell.

Colour is of little account in Queensland. Some countries like brown and others white-shelled eggs. We are only concerned as to quality. Thin-shelled eggs are liable to crack up in handling and become broken in transport, with the result that the egg content soils the adjoining eggs and spoils their appearance. The nest-boxes should be kept clean, and likewise the nesting material, to prevent eggs becoming cracked and soiled. Don't gather eggs with oily or dirty hands, nor place them in dirty receptacles. Always have shell grit available to your poultry.

Packing, Storing, Marketing, and Grading.

Packing.—Taints may be derived from packing, owing to the yolk of the egg being largely a fatty substance and having a strong susceptibility to scents generally, it is necessary to use nothing for packing that has a strong odour. Damp eggs or packing material, especially in warm weather, favours the development of mould bacteria, and should on no account be used. It is preferable to utilise odourless straw board fillers, which may be purchased to fit a petrol case, than to make shift with chaff or similar material. These cases and fillers may be returned and used again. Eggs forwarded in this manner generally carry better and command higher prices.

Storing.—When eggs are gathered, do not store them in the same room as decaying vegetables, onions, or kerosene, but in a cool, dry, well-ventilated room.

Marketing.—The markets largely depend upon the number of eggs you produce. In the country it is the common practice to sell to the storekeeper. This is not the best practice. Owing to the mixed quality of eggs that the storekeeper receives, he is unable to pay first-grade prices. The best markets as a rule are in large towns, and it would be more profitable to forward direct. If supplies are not large, co-operate with neighbouring farmers, and so obtain the benefits of the better prices. By doing so you also make large savings in freights. Market regularly, twice weekly if possible in summer.

Grading.—Eggs not being sold by weight need to be graded. The standard size for the first-grade egg is 24 oz. to the dozen. A large number of eggs under the 2-oz. standard are produced, but could be considerably reduced by only breeding from hens that lay 2-oz. eggs or over; and when purchasing a male bird be sure that he comes from stock that are layers of 2-oz. eggs. It is not necessary to have small eggs to get large numbers. Any eggs that are of doubtful quality, such as from a stolen nest, should be used on the farm or marketed separately.

Points.

1. Produce the unfertile egg for market.
2. Feed wholesome food and clean water.
3. Keep poultry houses clean, also nests and nesting material.
4. Gather eggs twice daily in summer. Collect with clean hands and use clean receptacles.
5. Store in a cool, airy room free from odours.
6. Keep eggs dry, also packing material.
7. Supply poultry with shell grit.
8. Market regularly.

Probable Effect of Low Quality Egg on Industry.

There is no doubt in my mind that the low grade and rotten egg has a serious effect on the value of our poultry industry in Queensland. A consumer who once purchases, or has served to him, a rotten egg, or even one highly-flavoured, will naturally be wary and keep off eggs for some time. This generally happens during the warmer months, when we have our flush season and low prices, and instead of encouraging consumption by producing a reliable article, we are to a large extent restricting it. According to the Commonwealth Year Book for the year 1922-23, the value of poultry and eggs produced in Victoria per individual of population was approximately 47s., while in Queensland it was only 11s. The industry will grow in Queensland, but a reliable egg must be produced to encourage consumption, and to assure our having a satisfactory and reliable article for export during a portion of our glut season.

"DIGGERS" ON THE LAND.

THE SOUTH BURNETT SOLDIER SETTLEMENTS.

The following notes have been abstracted from a departmental report by the Instructor in Pig Raising, Mr. E. J. Shelton:—

Taromeo.

This is situated 5 miles south-east of Nanango. The settlement is being devoted entirely to dairying and pig raising. Most of the farms are now well grassed. The principal outlet for this area is Nanango, where pig sales are held regularly, and where trucks are available for the transport of pigs intended for the co-operative bacon factories.

The settlement is well situated for an immediate extension of pig raising. The farms are mostly of scrub (rain forest or jungle), with a fair proportion of forest.

Rocky Creek.

This area is 12 miles to the south-west of Nanango, and contains some remarkably good dairying country. The farms are undulating and of good quality soil, and are being well grassed. There are also areas on most of these farms well suited to the growth of crops suitable for pig feeding, and no doubt the settlers on this area will in course of time be able to arrange for a local factory to be erected for the manufacture of either butter or cheese. The pig business is also well worth encouraging, and most of the settlers are very keen on introducing better types of pigs. They, in company with the settlers on Taromeo and on Neugma and Tarong, should be able to co-operate in a regular motor-lorry service for the conveyance of cream (or milk if a cheese factory is established) and for pigs and other produce.

A State school has recently been established. The average annual rainfall is about 56 in.

Neugma and Tarong.

These settlements are also in the initial stages of development, though at Tarong the farms are now well established. Both settlements overlook the Cooyar Valley, and are within 180 miles of Brisbane, cross country. The opening up of the Nanango-Yarraman railway would be of immense benefit to a large body of settlers on these several soldier settlement areas. The areas are all from 14 to 20 miles south-west of Nanango, and in area average 100 acres per settler. The local water supply is derived mainly from dams.

Boyneside.

This area is 30 miles west of Kingaroy, *viâ* Kumbia. It is within 20 odd miles of Bell, on the north-eastern side of that terminus.

This and Burrandowan settlement appeared to me to be the richest and most advanced of all these settlements. The ex-soldier farmers have very special advantages from a pig raising point of view, and there are extensive areas of rich alluvial land well suited to the growth of most of the crops required for pig feeding. Excellent crops of lucerne, corn, oats, potatoes, and barley were seen, while on most of the farms there are ample supplies of water. Pig raising should be one of the principal industries on these two settlements. There is great prospective values in the areas, and settlers are, to use a sporting phrase, on a good wicket.

Burrandowan.

This settlement is 40 miles north-west of Kingaroy, and is the most distant from railway connection of those visited, but settlers hope it will in time be connected up with one of the suggested cross country lines, such as the one from Mundubbera to Jandowae. The areas here range from 640 to 1,280 acres. Much of the country is specially suited for grazing and dairying, as well as mixed farming.

Pig raising will be a valuable industry. Burrandowan will also later on have its own township on a site already surveyed. A post and telegraph office has been provided. The State school has a good attendance. The Bush Nursing Association has established a centre at Burrandowan, and a trained nurse is at the service of the settlement generally. There is a regular motor-lorry service between Burrandowan and Wooroolin (35 miles), the nearest railway station and township.

Some remarkably fine crops were seen, particularly on the property of Mr. W. E. Fraser, and it is quite evident that there is abundant scope for the production of thousands of pigs on the rich river flats which form part of this area. I have travelled thousands of miles throughout New South Wales, Victoria, and Queensland, but have on no occasion seen ex-soldier settlers better provided for than on these several settlements. The average annual rainfall at Burrandowan is 40 in.

Charlestown.

This area is almost due east from Kingaroy, and is distant 7 miles from rail at Memerambi and 14 miles from Kingaroy. The farms average, approximately, 100 acres in extent. There is excellent dairying land with suitable areas for general cultivation. The water supply is sufficient on most farms, and pig raising will take its place as an adjunct to dairying, and should be a very profitable branch.

The Charletown settlers have good farms and most of the settlers are introducing good dairy herds. There is abundant opportunity here also for co-operation in handling the products of the settlement in transit to market. Memerambi is the nearest town and railway station, while cross country by a bridle track it is but 8 miles from Kingaroy. The average rainfall is about 35 in.

Gordon Brook.

This area is 18 miles north-west of Kingaroy, *viâ* Crawford. It will be principally devoted to dairying and mixed farming, and should be an important pig-producing locality. While a good deal of the land is more especially suited to grazing, there are large areas suited to general cultivation along the river flats, and such crops as lucerne and maize will flourish. It would pay every settler to cultivate as much land as possible. It did not appear to be that the Gordon Brook land compared as favourably from a pig-producing standpoint as Burrandowan and Boyneside, where conditions are far more favourable, though Gordon Brook has a decided advantage in being much closer to town and rail.

Generally, a fine progressive spirit characterises each settlement. The settlers, as naturally to be expected of ex-A.I.F. men, are fine Australian types, and their keenness, courtesy, and hospitality were most marked and much appreciated.

ADVANTAGES OF CENTRAL CO-OPERATIVE PACKING SHEDS.*

To understand and fully appreciate the advantages of any co-operative movement one must have the true feelings of "citizenship," which carry with them the natural protection of nations, communities, &c., and at the same time impose on the members individual responsibility.

Let us divide the question into two parts, and consider first the direct advantages:—

(*a*) Each grower will find it necessary to erect a shed to enable him to receive and pack his fruit, but he will not build one with anything approaching his proportion of the capital necessary to erect a central shed capable of serving, say, thirty or forty growers.

(*b*) To equip the shed for each grower would mean thirty sets of graders, implements, bins, &c., as against, say, one or two graders and five or six sets of other implements.

(*c*) Again, by collective action the company is enabled to acquire for the central shed more up-to-date mechanism. As an instance of this, an up-to-date grader will put through, say, 1,000 cases a day, and will serve twenty to thirty growers at a cost of, say, £250, or from £9 to £12 per member. It is impossible to acquire a grader of any description at such a price.

(*d*) Collectively, it is much easier to obtain any necessary financial assistance than it would be for each individual.

Let us now turn to what may be termed the indirect advantages, which lead to so many arguments. Orchardists generally give most of their attention—one might also say their exclusive attention—to their orchards, looking upon the selling of their products as the business of the agent, auctioneer, and storekeeper. They conscientiously attend to cultivation, pruning, spraying, &c., yet leave a vital branch of the industry to outsiders, whose interests are naturally to make as much as possible out of selling. What incentive has a salesman to hold out for a better price when he can clear his floor and pass another lot over, and so collect more commission? It is an all-important factor, inasmuch as it is the realisation of the year's efforts. Compare the grower's action in marketing his product with that of the manufacturer. Imagine (if possible) a manufacturer who has prepared his product for market, handing it over to agents to sell at what price they (the agents) chose to accept! A sales department is created and the article is pushed on to the market. This is where the packing company creates the necessary machinery to market the product of its members.

Growers have in the past built up a substantial barrier by supporting the present agency system of marketing, and the grower who still supports that system is helping to maintain the barrier to progress and supplying ammunition to the agents to fight their fellow-growers. The question naturally asked is: How can central packing sheds break down the barrier?

Supposing for a moment we wish to retain the present system of marketing through agents, the packing company speaks with one voice for thirty or forty or more growers, and the agent knows that by retaining or losing a packing shed's business he is retaining or losing thirty or forty clients instead of one. Needless to say, he is compelled to do his best in the latter case. The agent is also fully alive to the fact that sheds have a great advantage over individual growers, in that they can supply the shops direct and can maintain a supply to suit their clients.

We have become so accustomed to the present system that in many minds it seems impossible to change it. A change may take years to bring about, but we have many evidences before us that it can be accomplished. It has been accomplished by persistent and consistent efforts of co-operative bodies of primary producers. Take, for example, Denmark. Here we have intense cultivation and, one might say, "intense marketing." The producers have carried the matter to the final issue, and sell their products direct to the consumer through their own shops. Their organisations have grown to such an extent that Danish Governments are whole-hearted in their support

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* In a paper read by Mr. C. V. Henry, Manager of Batlow Packing Shed, before a gathering of orchardists at West Batlow, New South Wales.

of co-operative action. America, again, has shown us in the fruit business that they can sell their own products direct. It has also shown that to do so they had to standardise their output through packing sheds, as it was impossible to place large parcels of fruit in foreign countries without some guaranteed standard of quality and pack. They can then send their travellers out and sell on paper backed up by the uniformly graded and packed fruit. They have not only illustrated to us the possibility of altering the system, but have proved that the altered system is profitable to the grower, for it has been maintained for a considerable number of years.

Let us now touch on that most vital question to many growers—the cost of packing. In arriving at the cost of packing there are many items that may be on a par for the individual grower and the shed, especially if the former is enabled to buy in large quantities. For instance, cases, nails, wood-wool, wrapping paper, &c. These may not show in favour of the shed in some instances, but they generally do, for the reason that sheds, as a rule, buy in large quantities and are given better terms and conditions, while freights also are lower on large parcels of materials. There now remains the question of labour which largely depends on what labour is available. This applies to both grower and shed, but it does not admit of argument that the greater the quantity of fruit put through the more cheaply it can be done, always provided that labour available is identical. Finally, assuming that the individual grower and shed have purchased their material at the same cost, and that their labour is on a par, there remains the question of supervision. Many do not take into consideration this call upon their time, but where labour is employed we have something like thirty to forty supervising, whereas in the shed one is sufficient.

A question to remember, too, when a comparison of costs is made is: Is the fruit in both instances graded and put up to the same standard? This is necessary for obvious reasons; and to the credit of a central shed must be added the earning power of the grower during the time his fruit is being dealt with, when he is naturally released from all work and supervision and can devote more time to other matters.

We come now to the cost of overhead. This must be considered together with local conditions. Take as an example our local company. The charge was fixed at 6d. per case, and out of this is paid salaries, stamps, stationery, telegrams, insurance, interest, and incidental expenses. Under existing conditions we save practically all of this on our freight account alone; so by the united efforts of the growers they are saving that, and it is costing them little or nothing to run their business. While on this point mention might be made of the fact that by selling direct to shops at a price f.o.r., we also save the actual freight paid, which means another 8d. or 9d. per case. Can a grower do this unless he is in a very large way? The direct buyer also has an inducement to buy in this way; he has to pay for cartage and freight from, say, Sydney market, and it costs him less in many cases to rail direct from us.

This brings us to the question of the price obtained. Whether a shed obtains a better price could only be decided by marketing the same variety, grade, size, &c., at the same time and place, and by the individual grower and the shed placing their actual returns side by side for a season. The sheds have also the decided advantage of a greater advertisement, owing to its supplies being greater and extended over a longer period.

A co-operative company which has been mismanaged is no argument against the principle of co-operation. It should spur growers on to better things. Once satisfied that it is the right thing to work with your fellow-growers, see that the organisation is as perfect as possible. Mistakes are made in all walks of life, but let our mistakes prevent others in our future operations.

To enjoy the privileges of co-operative action we have to meet our individual responsibilities. Growers must sink their individuality to a large extent, obey rules that often do not appeal to them as necessary, yet at the same time give all their thoughts and energy to the rectifying of things in the business that may be or appear to be wrong. The conduct of the business end of his year's work has a lot to do with the rate of pay the grower will receive for his efforts. Having placed directors in charge, he should support them to the best of his ability in carrying out their task—the remedy is available to members should the Board fail to carry out its duties. Growers should also bear in mind that by delivering their fruit to sheds in as good order as possible, free from pests, &c., they assist largely in keeping down expenses.

Having banded themselves together, growers are in a position to obtain special conditions and discounts and better rates of freight, because they are enabled to buy their requisites in large quantities. This all assists both the company and the grower, who is able to buy many of his commodities more cheaply.

EGG-LAYING COMPETITIONS.

N.U.P.B.A., ZILLMERE.

The average for the N.U.P.B.A. egg laying competition at Zillmere during December was 16.5 eggs a bird, the various sections being White Leghorn, 17.7; Black Orpington, 15.6; other varieties, 13.1. There continues to be a large number of broodies, and several of the leghorns are moulting. Details:—

WHITE LEGHORNS.

Pen No.	Owner.	Dec.	Total.
104	Oakleigh, P. F.	26	234
21	Hodge, A.	24	208
82	Wakefield, W.	26	204
97	Sommerlad, K. A.	25	204
84	Wakefield, W.	25	202
20	Hodge, A.	17	198
12	Berry, W. J.	23	196
88	Duff, R.	24	194
95	Williams, G.	22	193
105	Oakleigh P. F.	20	193
89	Duff, R.	22	189
11	Berry, W. J.	27	185
79	Purnell, J. E. G.	23	184
92	Hodgson, C. A.	23	184
6	Pember, H. T.	18	181
19	Hodge, A.	15	181
90	Duff, R.	19	181
101	Walters, A. S.	23	180
16	Webster, J. T.	18	176
73	Raymond, E. C.	22	176
41	Cole, R. C.	22	175
58	Staib, A.	27	174
25	Britten, H. T.	20	171
51	Earl, J.	23	168
174	Grenier, S. L.	20	168
1	Williams, F. J.	21	167
106	Howard, W. L.	22	167
13	Marks, G.	19	165
56	Hutton, J.	21	165
61	Carinya P. F.	23	165
65	Tracey, E.	17	165
48	Turner, R. C. J.	13	162
64	Tracey, E.	21	162
80	Purnell, J. E. G.	17	161
74	Raymond, E. C.	21	160
78	Newberry, M. F.	13	160
99	Sommerlad, K. A.	22	159
39	Fraser, H.	17	158
68	Kidd Bros.	5	158
108	Howard, W. L.	22	157
40	Cole, R. C.	21	154
87	Enroh Pens	19	153
47	Turner, R. C. J.	23	148
100	Walters, A. S.	9	147
10	Berry, W. J.	15	146
76	Newberry, M. F.	8	146
38	Fraser, H.	14	145
5	Pember, H. T.	23	143
86	Enroh Pens	19	142
69	Kidd Bros.	21	141
98	Sommerlad, K. A.	19	140
34	Chapman, J. L.	24	139
62	Carinya P. F.	21	136
60	Staib, A.	5	135
172	Grenier, S. L.	22	135
26	Britten, H. T.	20	132
103	Oakleigh P. F.	4	130
45	Adams, P. F.	6	128
59	Staib, A.	17	127
46	Turner, R. C. J.	0	124
63	Carinya P. F.	22	122
83	Wakefield, W.	19	122
91	Hodgson, C. A.	10	121
93	Hodgson, C. A.	0	116
50	Earl, J. (replace 6th October, 1924)	21	59
30	Campbell, M. H.	19	B188
14	Marks, G.	24	B178
28	Campbell, M. H.	21	B175
67	Kidd Bros.	14	B175
52	Rogers, G. E.	19	B174
71	Wilson, J. R.	16	B174
42	Cole, R. C.	19	B167
75	Raymond, E. C.	19	B167
35	Chapman, J. L.	0	B161
29	Campbell, M. H.	7	B159
33	Hindes, W. and G. W.	23	B144
49	Earl, J.	9	B141
72	Wilson, J. R.	18	B139
77	Newberry, M. F.	9	B106
24	Neil, A.	0	B86
73	Grenier, S. L.	1	B81
7	Sturman, H.	7	B65
70	Wilson, J. R.	27	BE201
55	Hutton, J.	21	BE195
66	Tracey, E.	22	BE193
102	Walters, A. S.	24	E190
31	Hindes, W. and G. W.	20	BE183
85	Enroh Pens	12	BE181
18	Webster, J. T.	24	BE180
54	Rogers, G. E.	23	E180
53	Rogers, G. E.	22	E175
37	Fraser, H.	23	BE169
27	Britten, H. T.	18	E168
32	Hindes, W. and G. W.	20	BE167
36	Chapman, J. L.	22	E167
9	Sturman, H.	20	BE159
8	Sturman, H.	16	E153
3	Williams, F. J.	18	E147
2	Williams, F. J.	18	E147
23	Neil, A.	21	BE145
22	Neil, A.	16	BE143
96	Williams, G.	23	BE140
4	Pember, H. T.	11	E128
57	Hutton, J.	0	BE123

B Signifies bird under standard weight.
E Signifies egg under standard weight.

BLACK ORPINGTONS.

Pen No.	Owner.	Dec.	Total.
127	Walters, E.	17	209
125	Brotherton, T. H. ..	20	205
156	Hutton, J.	16	205
144	Cummings, F. P. ..	23	202
130	Rogers, G. E. ..	18	201
150	Raymond, E. C. ..	21	196
131	Rogers, G. E. ..	22	193
143	Cummings, F. P. ..	19	190
155	Hutton, J.	21	189
113	Wilson, W. R. ..	19	188
111	Fanning, T.	9	187
110	Fanning, T.	7	184
129	Walters, E.	11	182
139	Pryde, J. ..	15	178
149	Raymond, E. C. ..	24	174
116	Campbell, G. L. ..	12	173
133	Dennis, C. C. ..	14	171
153	Enroh Pens	19	171
120	Chaille, H. M. ..	16	166
125	Brotherton, T. H. ..	20	165
146	Everlay P. Y. ..	15	157
145	Everlay P. Y. ..	17	154
132	Rogers, G. E. ..	18	152
152	Enroh Pens	20	151
148	Raymond, E. C. ..	18	150
134	Dennis, C. C. ..	13	148
128	Walters, E.	11	145
112	Wilson, W. R. ..	11	142
137	Adams, W. S. ..	16	137
121	Potter, J.	16	101
141	Pryde, J. (replace 7th July, 1924) ..	16	97
124	Brotherton, T. H. (replace 30th August, 1924)	20	95
118	Chaille, H. M. ..	2	82
119	Chaille, H. M. ..	24	B177
142	Cummings, F. P. ..	25	E219
147	Everlay P. Y. ..	23	E217
154	Hutton, J.	25	E204
114	Wilson, W. R. ..	5	E191
138	Adams, W. S. ..	15	BE185
123	Potter, J.	9	E175
140	Pryde, J.	18	E174
136	Adams, W. S. ..	15	E159
109	Fanning, T.	26	E156
115	Campbell, G. L. ..	0	E143
117	Campbell, G. L. ..	0	E140
122	Potter, J.	3	E131
151	Enroh Pens	13	E125
135	Dennis, C. C. ..	13	E118

OTHER VARIETIES.

159	Messines P. Farm (R.I.R.) ..	23	185
161	Ollier, T. C. (B.R.)	11	158
168	Forsyth, W. H. (S.W.)	22	157
169	Pryde, J. (Lang.) ..	10	155
157	Messines P. Farm, (R.I.R.) ..	20	150
165	Walters, A. S. (B.R.)	14	145
167	Forsyth, W. H. (S.W.)	13	143
180	Ferguson, J., and Son (B.L.)	12	141
160	Ollier, T. C. (B.R.) ..	13	139
158	Messines P. Farm, (R.I.R.) ..	10	131
166	Forsyth, W. H. (S.W.)	14	128
178	Ferguson, J., and Son (B.L.)	10	120
164	Walters, A. S. (B.R.)	12	108
176	Everlay P. Y. (B.L.)	3	98
163	Walters, A. S. (replace 3-7-24) (B.R.)	11	91
170	Pryde, J. (Lang.) (replace 23-6-24)	10	B120
175	Everlay P.Y. ..	10	E166
162	Ollier, T. C. (B.R.) ..	14	E139
177	Everlay P. Y.	17	E113
171	Pryde, J. (Lang.) (replace 21-6-24)	17	E108
179	Ferguson, J., and Son (B.L.) ..	9	E105

B Signifies bird under standard weight.
E Signifies egg under standard weight.

N.U.P.B.A. TOOWOOMBA SUB-BRANCH.

Single Test Egg-Laying Competition—Scores to 31st Dec., 1924.

BLACK ORPINGTONS.

Pen No.	Owner.	Dec.	Total.
41	Wilson, W. R. ..	24	210
51	*Holmes, R.	23	208
24	*Carr, T. J.	23	203
42	Wilson, W. R. ..	20	202
23	Carr, T. J.	21	194
29	*Adams, W. S.	19	191
15	Macfarlane, K. ..	23	190
10	Everlay Poultry Farm	26	187
9	Everlay Poultry Farm	9	185
45	Stephens, H. B. ..	6	185
20	Maund, Mrs. L. ..	16	183
30	Adams, W. S. ..	28	183
25	Stephens, Moss ..	25	182
28	Williams, W. D. ..	17	181
32	Radford, G.	22	181
39	Rogers, G. E. ..	20	181

* Signifies bird laying under-weight eggs.

BLACK ORPINGTONS—*continued*

Pen No.	Owner.	Dec.	Total.	Pen No.	Owner.	Dec.	Total.
50	Ollier, T. C.	21	180	33	Potter, J.	6	143
7	*Adams, R. F. ..	22	178	1	Hutton, Jas.	10	142
40	Rogers, G. E. ..	7	176	44	Smith, E. R.	13	142
19	Maund, Mrs. L. ..	20	174	21	Walsh, H.	11	138
48	Head, J.	24	172	37	Short, J. W.	18	135
2	Hutton, Jas.	8	170	47	*Head, J.	16	134
6	Walters, E.	21	170	8	Adams, P. F. ..	17	132
36	Rivett, R. R.	19	170	34	*Potter, J.	18	132
52	Holmes, R.	0	169	38	Short, J. W.	16	127
22	*Walsh, H.	14	168	11	Webb, A. W.	0	122
16	*Macfarlane, K. ..	24	167	4	McLay, J. A. ..	14	120
43	Smith, E. R.	13	163	26	Stephens, Moss ..	10	119
5	Walters, E.	1	160	18	Champion, S. H. K. ..	17	114
13	Burns, R.	18	157	31	*Radford, G.	2	96
27	Williams, W. D. ..	16	154	35	Rivett, R. R.	6	77
49	*Ollier, T. C.	6	153	17	*Champion, S. H. K. ..	0	41
3	McLay, J. A. ..	11	148	12	Webb, A. W.	0	16
14	Burns, R.	20	147	46	Stephens, H. B. ..	0	1

OTHER VARIETIES.

70	Dibbs, H. (Lang.) ..	27	229	56	Carr, T. J. (S.W.) ..	9	148
53	Warrian, C. G. (Rock.)	26	216	54	Warrian, C. G. (Rock.)	13	137
60	Le Pla, A. W. (R.I.R.)	1	193	69	Dibbs, H. (Lang.) ..	24	137
66	Becker, W. (Lang.)	16	189	71	Brand, V. (R.I.R.) ..	6	135
65	Becker, W. (Lang.)	25	179	72	Brand, V. (R.I.R.) ..	15	113
57	Maund, Mrs. L. (Col. W'dotte) ..	15	177	63	Rafter, J. J. (B.L.)	21	111
59	Le Pla, A. W. (R.I.R.)	15	170	67	Everlay P. F. (B.L.)	11	100
68	Everlay P. F. (B.L.)	22	167	55	Carr, T. J. (S.W.) ..	8	96
64	Rafter, J. J. (B.L.)	21	151	58	Maund, Mrs. L. (Col. W'dotte)	11	96
61	Harrington, J. (B.L.)	7	149	62	Harrington, J. (B.L.)	0	42

WHITE LEGHORNS.

132	*Short, J. W.	24	232	75	Wilson, W.	18	169
112	*Chapman, S.	21	217	117	Goggins, J.	19	169
73	Dippell, D. H. ..	26	210	74	Dippell, D. H. ..	10	168
131	*Short, J. W.	22	209	128	Stilton, E. J.	21	167
114	Cole, R. C.	21	208	86	Rivett, R. R.	14	167
110	*Enroh Pens	24	202	97	Hunt, G.	23	165
91	Stilton, G.	25	201	99	*Newton, J. W. ..	22	165
105	Hutton, Jas.	18	201	116	Taylor, Jas.	17	164
122	Grant, W.	25	201	120	Rogers, G. E.	20	163
123	King, J. E.	24	199	80	McBean, S.	24	162
118	Goggins, J.	26	199	104	*Fallon, P. J.	24	160
121	Grant, W.	18	198	126	Maurer, G.	22	160
113	Cole, R. C.	22	189	107	Adams, P. F. ..	20	158
129	Manning, H. G. ..	22	188	76	Wilson, W.	15	157
88	*Warren, C. G. ..	28	187	90	Ellis, L. E.	21	157
111	Chapman, S.	17	187	102	Turner, R. C. J. ..	24	157
115	Taylor, Jas.	23	187	103	*Fallen, P. J.	14	157
124	King, J. E.	5	186	79	*McBean, S.	18	155
100	*Newton, J. W. ..	21	179	92	Stilton, G.	22	151
85	Rivett, R. R.	21	178	81	Smith, E. R.	10	149
106	Hutton, Jas.	12	178	108	Adams, P. F. ..	4	149
96	Adams, W. S. ..	23	177	77	Howard, R. B. ..	1	146
130	Manning, H. G. ..	28	177	83	Carinya P. Farm ..	20	146
101	Turner, R. C. J. ..	22	176	119	Rogers, G. E. ..	17	142
93	Williams, D. W. ..	20	175	84	Carinya P. Farm ..	17	139
95	Adams, W. S. ..	23	175	89	Ellis, L. E.	19	139
109	*Enroh Pens	18	175	127	Stilton, E. J. ..	8	134
125	*Maurer, G.	18	173	94	Williams, D. W. ..	20	133
87	Warrian, C. G. ..	24	172	98	Hunt, G.	20	126
78	Howard, R. B. ..	15	170	82	Smith, E. R.	18	121

* Signifies bird laying under-weight eggs.

JOSEPH GARNER, Supervisor.

DAIRYING ON THE DOWNS.

A RECORD SEASON.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has received the following report from Mr. C. McGrath, Dairy Instructor, Toowoomba:—

Report on the Dairying Industry on the Darling Downs for the year 1924.

Following the most trying experience of the previous year, owing to a prolonged dry spell, the period herein reviewed was generally favourable to agriculturists, dairy farmers, and graziers. The wonderful fertility of the Downs is everywhere in evidence. The dairying industry, which received a serious setback through loss of revenue and heavy losses of dairy stock, has made a wonderful recovery, and this season will be a record one.

This is no small achievement, and I think I am not stating too much when I record that this amazing recovery is due to the pluck, hard work, and perseverance of the dairy farmers. Depleted dairy herds have been strengthened, and extensive improvements carried out on many dairy holdings.

Handling and Carriage of Cream.

Milking machines have been installed on a number of dairy farms. The necessity of frequent deliveries of cream to the dairy factory is an all important factor in the production of a first-grade article. Dairy farmers located in districts where train service is irregular are at a great disadvantage. The use of rail motors on branch lines may prove the solution of the difficulty by providing a more regular service in such cases.

The motor cream delivery van is fast taking the place of the horse-drawn vehicle. The fast service made available by motor trucks has a beneficial effect on the quality of the cream reaching the factory by this method. During the summer months the effect of the carriage of cream over long distance by rail is much in evidence.

The use of ice-cooled cream wagons would have a beneficial effect on the quality of the cream consigned by rail over long distances. Protection of cream on transit to the factory has received more attention than formerly.

The cooling of the cream on the farm at the time of separation is strongly recommended as a means of improving the quality of the cream received at the factories. Small suitable aerators and coolers are procurable through factories or ordinary trade channels for this purpose. The care and condition of dairy utensils has at all times been brought prominently before dairy farmers. It is not sufficiently recognised that rusted, dented, and broken utensils, chiefly cans, are responsible for many objectionable taints and odours in cream and milk that lower the grade of the product. A rusty surface on the inside of a can is one of the chief troubles, but one which in cases of tinned steel vessels can be remedied by retinning. When cream or milk comes in contact with rust patches, it will develop a metallic or tallowy flavour —a most objectionable taint in dairy products. The use of insanitary cans is against the best interests of the dairy farmers and the industry. A standard sanitary milk and cream can is required by those engaged in the industry.

Progress in Manufacture.

Turning to what after all is a matter of equal importance to the industry—*i.e.*, the manufacturing department—one can report decided progress. Dairy factory equipment is being modernised, and the dairy world's latest improvements in machinery and the most modern ideas of dairy factory practices appeals to the management of the Downs dairy factories. All butter factories in this area are equipped with pasteurisers.

The Warwick Co-operative Dairy Company are erecting a modern butter factory of brick and concrete at Mill Hill. It is to be furnished with the latest approved butter factory equipment. It is an evidence of the great faith that the directors and management have in the dairying possibilities of the Downs. When opened it will compare favourably with the most modern of butter factories, as the planning and equipment has had careful attention of the manager, directors, and dairy engineers. No matter what branch of the dairying industry is taken, the improvement in the last few years is evident. The improvement in dairy cattle—well, is not all that an enthusiast desires—but it is apparent. Pure sires are being more extensively used. Herd testing is receiving more attention than formerly. Its extension is necessary in order to cull out many unprofitable cows from the dairy herds. The facilities now available for testing dairy cows for production cannot be too widely known. The health of the dairy stock has been satisfactory. The dairy herds are under the supervision of the dairy inspectors. Any dairy animal showing signs of ill health is

isolated and dealt with by the Veterinary Department. The market value of dairy cows and heifers was low.

The class of pigs kept on the farms has generally improved, as is evident by the quality of the bacon pigs forwarded to the factories. The number of bacon pigs sent to the factories increased considerably. The price for fat pigs fluctuated considerably during the year.

Fodder Conservation.

Fodder conservation is a matter of vital importance to the dairy farmer. Numerous stacks of hay are to be seen throughout the district. The conserving of fodder in the form of silage or ensilage is not receiving the attention that this method warrants. The beneficial effect of the activities of the various branches of the Primary Producers' Association is apparent. The work of the various sub-departments is becoming more appreciated by primary producers. Much of the ill-considered criticism so much in evidence on the launching of the scheme has ceased. It is realised that much of the seemingly useless spade work was a necessary preliminary to the cultivation of our large untilled field of co-operative education.

The majority of the primary producers of Queensland have risen to the fact that the industries in which they are interested require the co-operation and assistance of all engaged therein, so that they can with confidence face the keen competition of well-organised and otherwise advanced rivals in the markets to which they look for the disposal of their produce.

VINCA ROSEA—A REPUTED CURE FOR DIABETES.

By C. T. WHITE, Government Botanist.

Mrs. H. N. Uffindell, of Lower Mitcham, South Australia, has drawn my attention to the use, in South Africa, of the herb Vinca as a cure for diabetes. Mrs. Uffindell, hearing that the plant was a common weed in Queensland, wrote requesting a supply of leaves and at the same time enclosed a cutting from a South African paper giving the following directions for using the plant:—

Vinca Treatment of Diabetes.

Each day boil twenty-seven leaves in three and a-half cups of water for fifteen minutes, then strain. Take one cup after each meal; one hour afterwards as much bicarbonate of soda as can be got on a sixpence in half a glass of warm water. Diet consists of all green vegetables, meat three times a day, game, fowl, or bacon for a change, some apples. Avoid ordinary bread.

In South Africa, Mr. E. E. Whyte, the discoverer of the value of Vinca in diabetes, has put up a proprietary medicine termed "Covinca," for which it is claimed that eight out of every ten cases of sugar diabetes will find the use of Insulin and strict dieting unnecessary.

As the plant is a very common weed in Queensland, the following description and accompanying illustration are published for the use of sufferers who may care to make a trial as to the efficacy or otherwise of the plant. It most commonly occurs along sandy beaches, particularly from Maryborough northwards; about Brisbane and more southern localities it is not so common, but may often be seen as a stray from garden culture.

Two varieties or forms occur, the one with pink (the type) and the other with white flowers (var. *alba*); the properties are most probably the same in both.

Description.—A perennial herbaceous plant 1 to 2 ft. high. Leaves arranged in opposite pairs, elliptic in outline, 1½ to 2½ in. long, nearly 1 in. broad tapering at the base to a short stalk of about ¼ in. Flowers borne in the uppermost leaf axils; calyx green about ¼ in. long divided to about the middle into five narrow lobes; corolla with a slender tube a little over an inch long dividing at the apex into five flat pink or white lobes 1½ in. across; lobes obovate rather lopsided, much narrower towards the base. Seed capsules in pairs, long and narrow, about 1¼ in. long full of small black oblong seeds, each seed about 1 line long.

Distribution.—A native of the West Indies and Tropical America, now naturalised in most of the warmer parts of the world.

Common Name.—Species of the genus Vinca are commonly known as Periwinkle.

Botanical Name.—*Vinca,* from the Latin *vinculum,* a bond or fetter in allusion to the twining shoots of some species of the genus; *rosea,* Latin referring to the pink colour of the flowers of the type.

Botanical Reference.—*Vinca rosea* Linnaeus species Plantarum 305.

PLATE 26.—VINCA ROSEA, A REPUTED CURE FOR DIABETES.

GRAINS AS FOOD FOR FARM ANIMALS. *

Wheat is not regarded as a suitable food for horses, and is not widely used in this country. If eaten by horses unaccustomed to it, it is liable to cause digestive troubles and laminitis. Wheat can, however, be fed to horses without causing ill effects if they are brought on to it gradually. Part of the prejudice is due to want of experience in its use. To be properly utilised it should be mixed with other grains, such as maize and oats. As much as 7 lb. of wheat may be given daily, but smaller amounts should be given at first. It should be clean and free from mould, and is best fed whole.

The question of cost is also a factor owing to the value of the commodity as a food for ourselves.

Damaged wheat is often boiled and fed to pigs, and whole wheat is largely used as poultry feed.

Barley.

Most of the barley produced in this State is used for malting purposes, and except when its quality is below the maltster's standard its price prohibits its use as a stock food. As a grain it has come more into favour of latter years.

When the horse's teeth are good and the labour not severe, barley may be fed to this animal whole. The grain is probably better rolled before being fed, but if finely ground it is brought by the saliva into a pasty mass. Where maize and oats are not procurable, barley is largely used for horse feed; 4 lb. per day fed whole with chaff gives good results. It may also be scalded or boiled, when 6 lb. of the soaked grain is fed. A daily ration for horses in full work is: Chaff, 20 to 30 lb.; barley, 4 lb. dry to 6 lb. soaked. Twice a week bran should be given at the rate of 4 lb. per horse. Barley may be profitably employed as a feed for milk cows and pigs. A good food ration for cows is: Barley meal, 10 lb.; molasses, 3 lb.; hay, 20 lb. Barley must be ground into meal or boiled to make it wholesome feed for pigs. The operation of boiling must be continued for at least twelve hours, the grain being allowed to simmer to a pulp, and care taken to prevent burning by adherence of the grain to the side of the heater.

Barley has a reputation for the production of high-class bacon. As it is carbonaceous in character, and is also not especially palatable to pigs, it should never be fed alone, but with palatable protein-rich foods. Barley is also valuable as a poultry food.

The food value of this grain for various classes of stock is not properly recognised here, though it is popular as a green fodder crop.

Oats.

Oats rank as one of the best grains for horses. It combines all the elements necessary for nutrition in such proportions that the animal is able to consume a large amount without upsetting the digestion, and to extract the greatest possible amount of nourishment from it. Oats have been found to be the finest feed for horses of speed. Horses are very fond of this feed, and will eat it in preference to all other grain. It probably comes nearer the requirements of a concentrate for horses than any other single grain. The kernel is encased in a hull, which adds to its value as a horse feed.

Oats are rich in muscle-forming food, and possess moderate heating power. Compared with maize, they have more protein and less carbohydrates. They may be fed whole or crushed. It is not advisable to feed new oats or oats that are musty or mouldy. They are usually fed with chaff at a rate up to 10 lb. a day. Some useful oat rations were given in these notes recently in an article on chaff. Oats may form the entire grain ration for horses. The substitution of 2 or 3 lb. of wheat-bran improves the daily ration, provided it does not produce a too laxative effect. The use of wheat-bran with oats also lessens the tendency towards choking.

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* In "Agricultural and Pastoral Notes," N.S.W. Department of Agriculture.

Ground with meal and made into gruel, oats form one of the best foods for young stock. Crushed oats are very useful for foals at weaning time; 2 to 3 lb. may be fed daily up to one year old, and 4 to 5 lb. up to two years old, when running on good pasture.

It is important to note that the albuminoid matter of oats is identical with the casein of milk and cheese. This fact makes oats a valuable feed for milk cows, being equal to bran for them. Oats are not fed largely to pigs, the reason being obvious if pigs are being fattened rapidly for market, but for breeding stock and stock not being fattened they are a useful feed. Crushed oats are fed in this country to working stud rams at the rate of ¼ lb. a day, but are not fed generally to flock sheep.

In the feeding of horses in Australia generally the plan of giving the food nearest at hand is largely adopted, with the result that maize is fed more than oats to horses throughout New South Wales. Actually, oats cost less, weight for weight, than maize.

Maize.

Maize is one of the most valuable of grain foods, and is estimated as the best fattening food known for all kinds of stock used for human consumption. On account of its fattening and heating qualities it is not suitable for feeding alone to horses, but in conjunction with another food, such as oats, bran, dried grains, &c., is highly valuable and easily digested. Maize is very largely used in this State as the chief grain for horses, largely because it can be more easily obtained than oats and is often grown on the farm. It is fed on the cob, or shelled, or ground. When shelled or ground it is usually fed with chaff and bran.

Maize is rich in carbohydrates and more energy is derived from 1 lb. of maize than any other suitable grain. It is considered an economical part of a ration. Since maize is low in protein, to be correctly used lucerne hay or other leguminous hay should be fed with it. In the absence of legumes a little oil meal or other protein concentrate may be included in the ration. Horses that have not been accustomed to maize should not be put on to it suddenly. It may form the major part of the grain ration for horses if a nitrogenous (protein) roughage is fed or some protein concentrate added to the ration.

Maize meal is sometimes fed as part of the ration for milking cows in conjunction with hay or chaff. Bran is usually fed in this ration to increase the protein and to counteract the constipating effect of the maize meal. Maize meal is also sometimes added to skim milk as a calf food.

Maize is largely used as a feed for pigs, particularly in the coastal districts, and is generally fed in the husk. There is very little advantage in grinding it for pigs. It is fed in conjunction with skim milk, which forms a well-balanced ration.

As a feed for sheep in times of drought, maize has proved very useful in this State, providing some roughage in the form of lucerne hay, silage, or natural scrub is available. About 6 oz. per sheep is fed daily, scattered on the hard ground.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

The Scrub Wilga (*Geijera salicifolia*) is a very common tree in some of the "scrubs" in localities where the rainfall does not exceed about 50 in. per year. It is a straight, tall-growing tree with a somewhat scaly bark, and does not often exceed about 18 in. in stem diameter. When cut the bark is pleasantly aromatic, and, as pointed out to us by Mr. W. Fraser, of the Forestry Department, the cut surfaces of the bark upon exposure to air rapidly assume a dark brown colour. The timber is very heavy and finely grained, and so far does not appear to be extensively used. The species is confined to Australia and is common in the scrubs of the coastal area from Illawarra in New South Wales to the Barron River, North Queensland. There are two races of this species, one with narrow leaves and the other with broad ones. The two forms are shown in the accompanying illustrations of the leaf specimens.

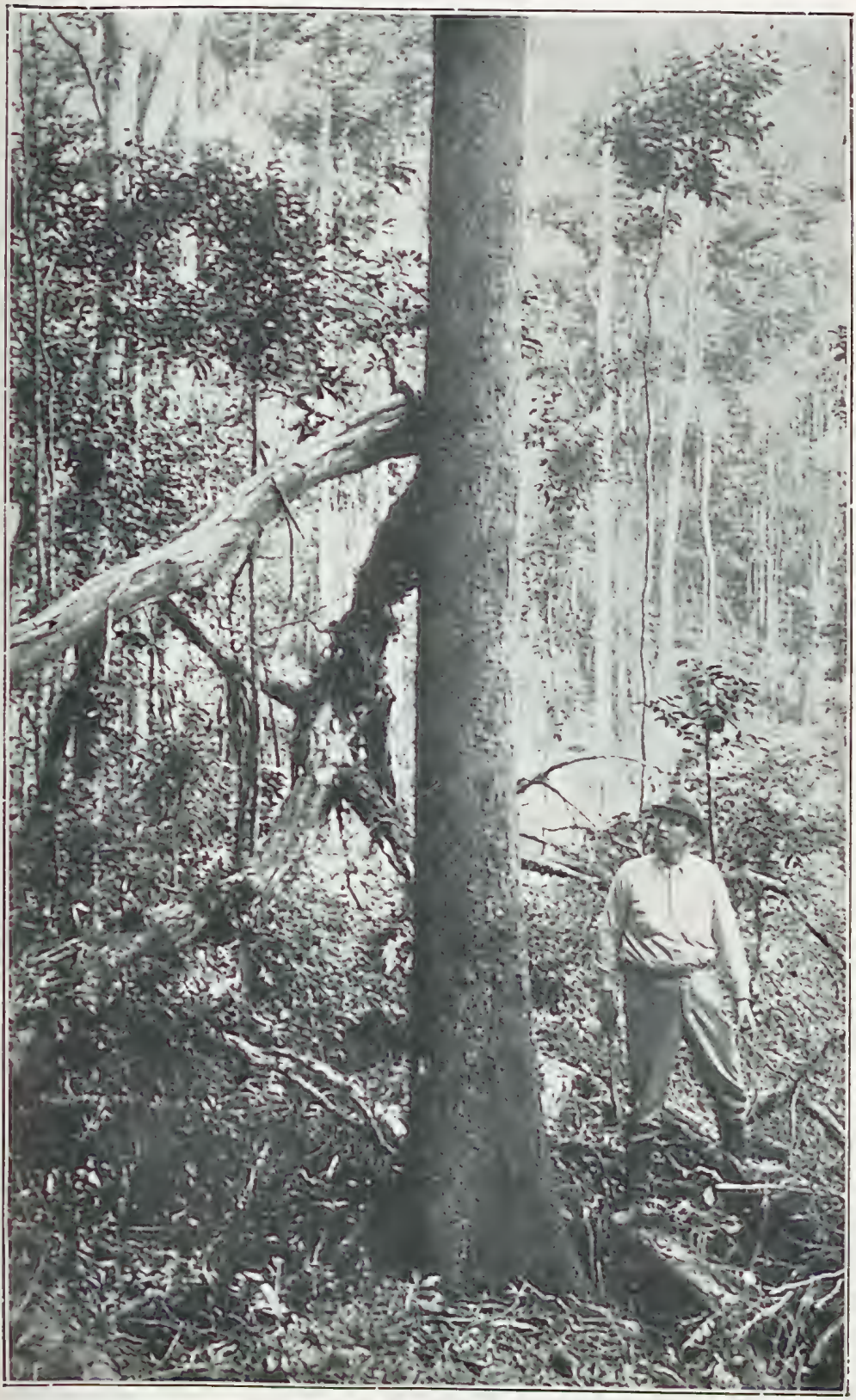


Photo. by the Authors.]

Plate 27.—The Scrub Wilga (*Geijera salicifolia*).
A tree in the Imbil rain forest.

PLATE 28.—LEAVES, FLOWERS, AND DISCHARGED FRUIT OF THE SCRUB WILGA (*Geijera salicifolia*).

The narrow and broad forms of the leaves are shown.

POTATO VARIETY TRIALS IN MARY VALLEY DISTRICT.

By C. McKEON, Instructor in Agriculture.

The Mary Valley is noted for the quality and excellence of its potatoes. With a view to the introduction of certain varieties not commonly grown in the district, variety trials were carried out by the Department of Agriculture and Stock on Mr. A. Ernst's farm, Bollier Plain, Kandanga.

The land selected for the trials was of a medium heavy black loam, rich in organic matter, which had been lying fallow for twelve months and previously cropped with maize.

The varieties comprised Manhattan, Scottish Triumph, Earliest of All, Carmen No. 1, Carmen No. 3, Up to Date, and Brownell's Beauty.

The seed, with the exception of Brownell's, was in nice forward condition for planting. Being above medium size, it was cut into suitable sets with two and three eyes to the set, and planted out, under favourable conditions, on 21st August last year. Drills were run out 3 ft. apart with the plough, and the potatoes covered with 3 to 4 in. of soil by a single horse scuffler and the land harrowed immediately after. During the growing period the soil between the rows was kept in good condition by frequent cultivations. Towards the latter end of the season heavy rains induced an excessive growth of weeds, which had an effect of slightly reducing the yields. Potato plots were approximately one-fifth of an acre each in size. Yields were worked out on an acre basis with an allowance of 18 in. on both sides of each individual plot.

Harvesting was commenced on the 9th and completed on the 13th December, 1924. The variety "Earliest of All" matured a week previous to "Beauty of Hebron," which in this respect was a few days ahead of the other varieties grown.

Varieties.	Yield per Acre.			
	Tons	Cwt.	Qr.	Lb.
Manhattan	4	13	3	14
Scottish Triumph	5	0	1	15
Earliest of All	4	4	3	21
Beauty of Hebron	3	19	0	19
Carmen No. 3	4	4	0	10
Brownell's Beauty	2	10	1	19
Carmen No. 1	4	2	0	18
Up to Date	4	3	0	1

Description of Varieties.

Brownell's Beauty.—Flattish, ovate, and somewhat irregular in shape, skin netted, eyes plentiful with deep crescent scars, distinct pinkish eyes, and of deeper pink than surrounding skin.

Manhattan.—Flattish, ovate in shape, generally mottled, but blue predominating, eyes medium in number, having distinct crescent, skin usually smooth, but in some cases slightly netted.

Scottish Triumph.—Elongated ovate, flattish in shape, smooth skinned variety, white, eyes few in number, somewhat shallow, with distinct crescent.

Carmen No. 1.—Flattish, round, white, eyes shallow, with crescent distinctly marked, skin slightly netted.

Carmen No. 3.—Similar to No. 1, but No. 3 somewhat rounder than No. 1, white, distinct eyes, crescent irregular, skin netted.

Earliest of All.—Distinct kidney type, white, eyes numerous, with crescent lightly defined, very similar to what used to be known as "White Kidney."

Up to Date.—Ovate, smooth skin, white, eyes shallow, few in number, crescent lightly defined.

Beauty of Hebron.—Round, white, eyes numerous, well defined, deep crescent, skin smooth.

PLATE 29.—MANHATTAN.

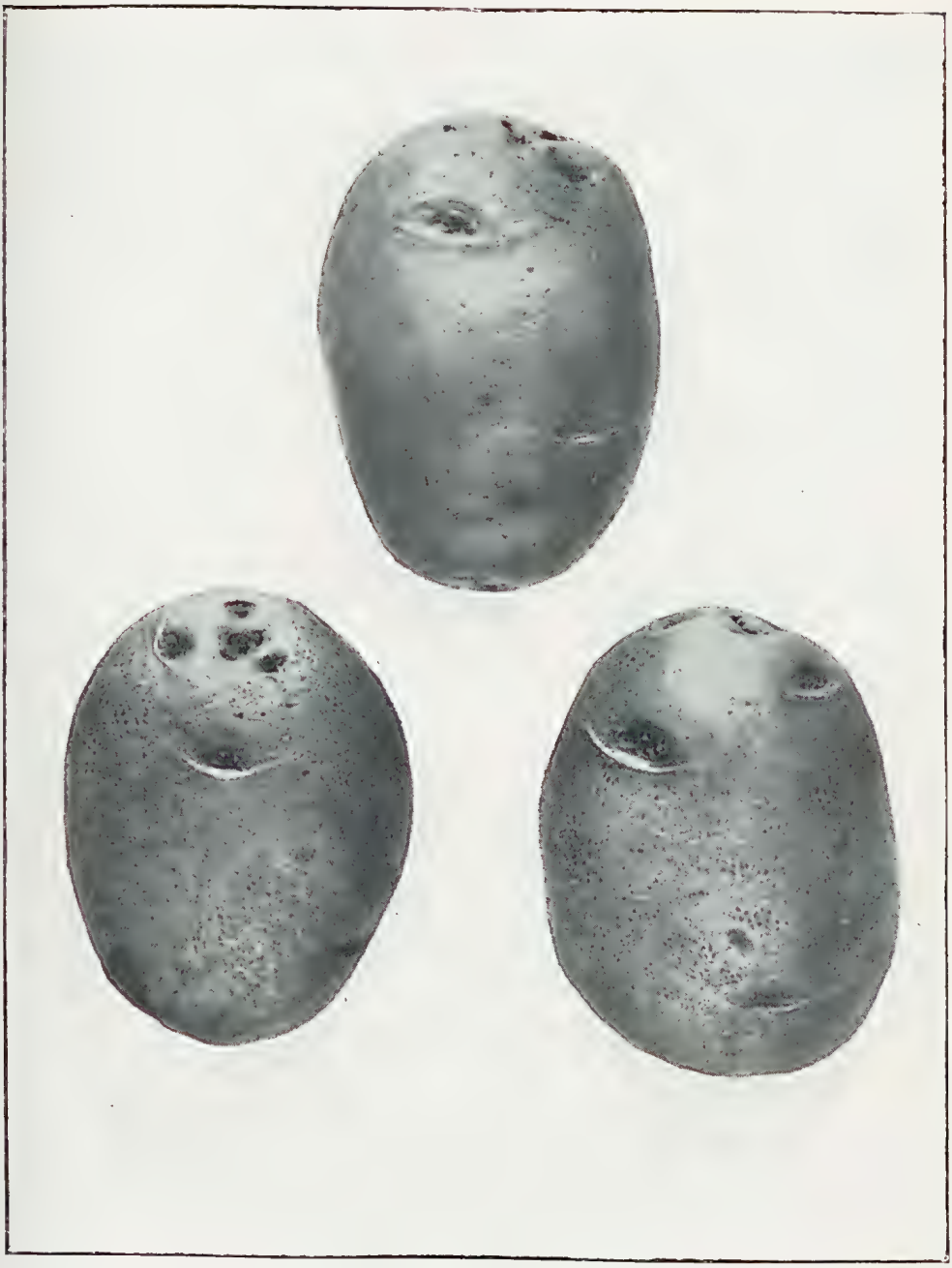


Plate 30.—Scottish Triumph.

PLATE 31.—EARLIEST OF ALL.

Plate 32.—Carmen No. 1.

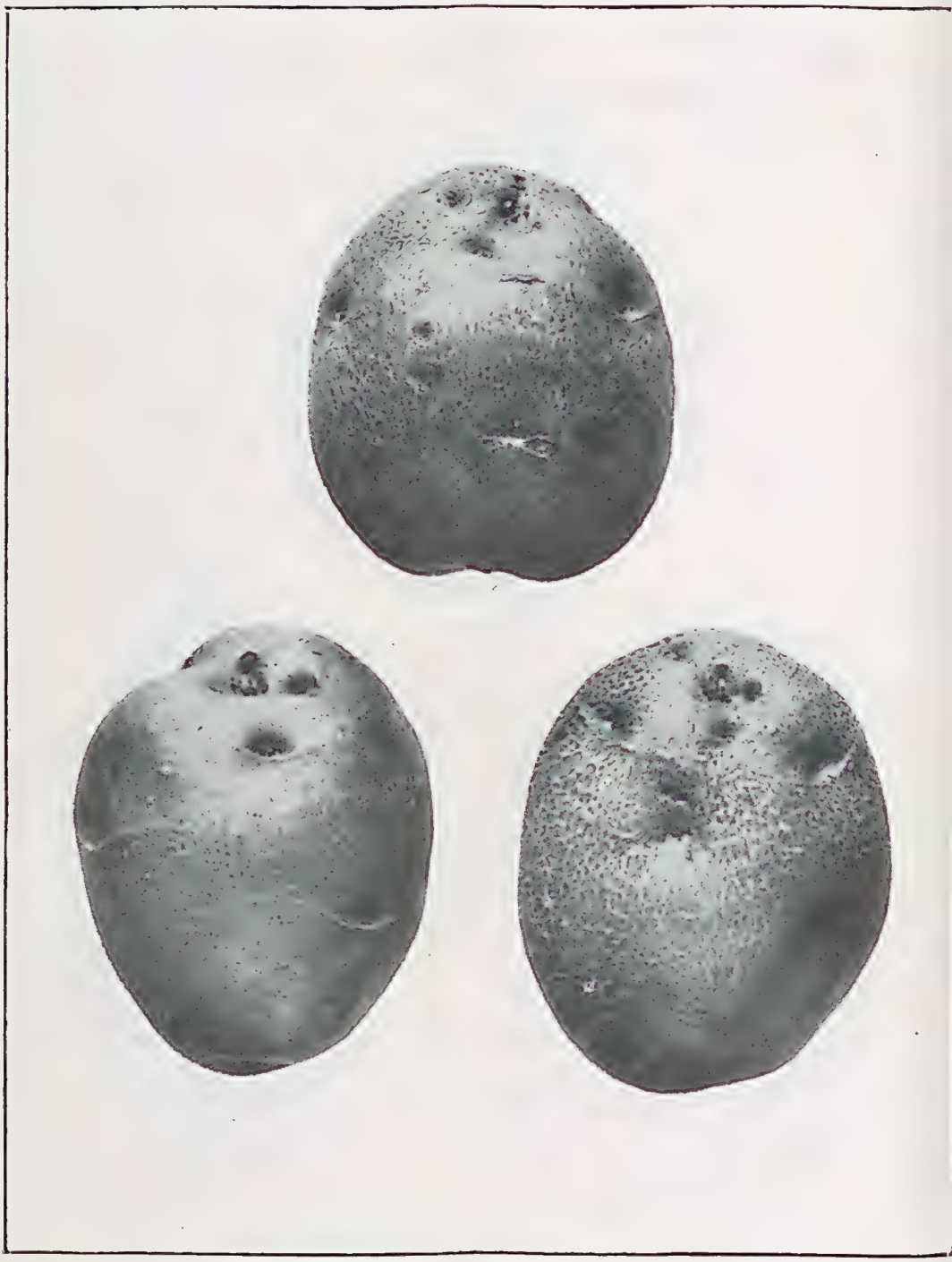


PLATE 33.—CARMEN NO. 3.

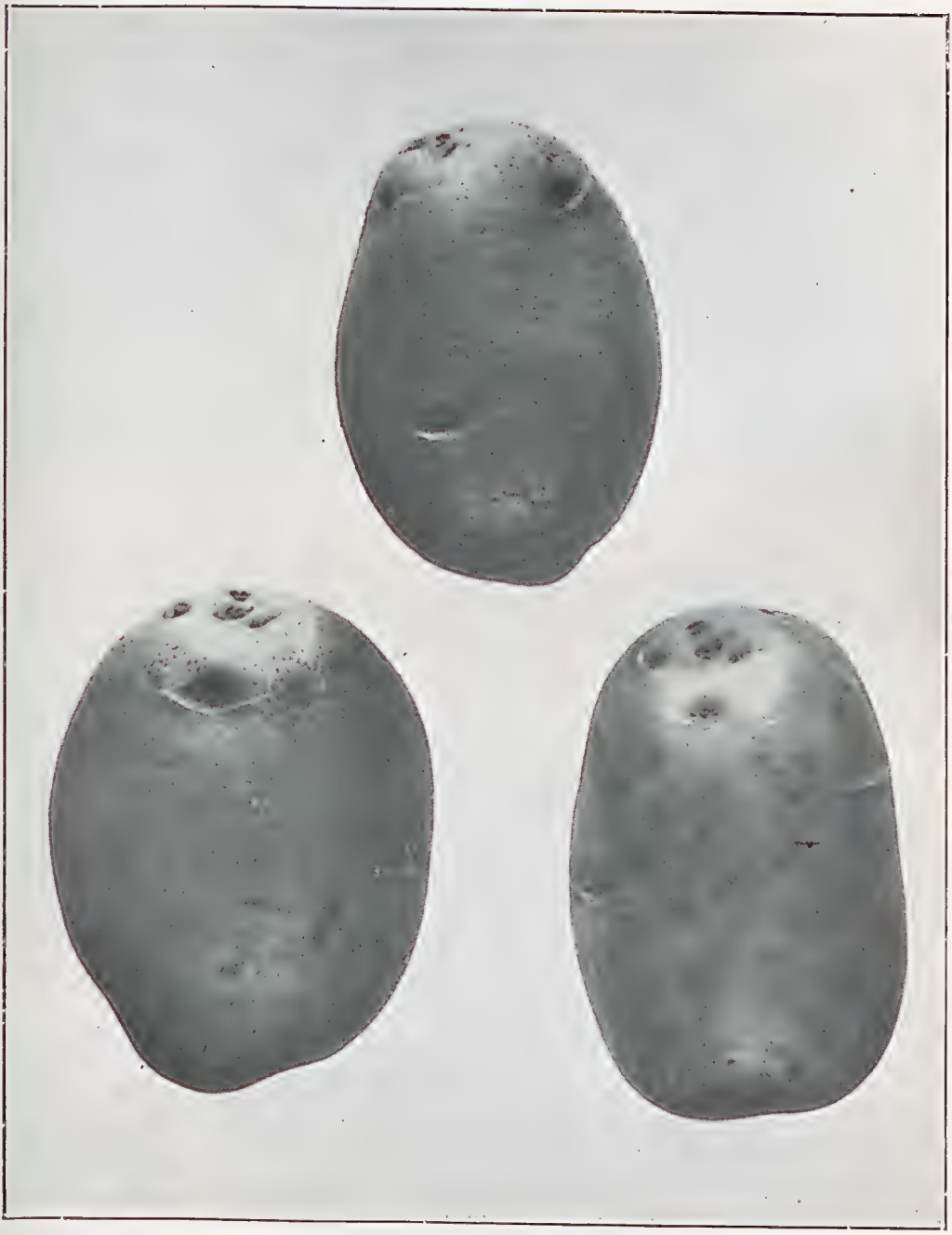


Plate 34.—.Up to Date.

NECROTIC ENTERITIS OF PIGS.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., Department of Agriculture, New South Wales.*

Necrotic enteritis is a name applied to an infectious disease which is causing some considerable loss in the pigs of this State The disease is one which affects the inner surfaces of the bowels and sometimes the stomach, causing the lining membrane to become congested, thickened, and covered with dirty brown-coloured masses of dead tissue. Sometimes but few of these areas are present, raised up in roughly-rounded masses with well-defined margins. At other times larger areas are involved by extension of the smaller lesions, until a great part of the bowel shows the presence of the scab-like masses of dead tissue. Young pigs up to the porker stage are more frequently affected than are aged animals, but the disease may attack pigs of any age and any class.

It is usually assumed that the disease is due to infection with the bacillus of necrosis, but many investigators now state that this germ, although often implicated, is not the primary cause. Numerous other germs have been found associated with the condition. Most of these are commonly found in intestinal contents and in dung. Hence, the proper sanitation of the piggery plays an important part in the control of the disease.

Symptoms depend largely on the extent and virulence of the infection, the age of the pigs, and their condition. The symptoms do not always give an indication of the extent of the lesions, since often a fat pig may show a large area of affected bowel, while in other cases a pig obviously ill and in poor condition may show comparatively few necrotic areas when examined after death.

As with most pig diseases, the first sign of illness is that the sick pigs are not inclined to eat, and lie about in a sheltered spot away from other animals. At times they may make their way to the feed trough, but do not eat much, and turn away to lie down again.

Within a few days it is noticed that diarrhœa has set in, the pigs passing a semi-fluid dung at frequent intervals. Owing to the capricious appetite and the constant weakening effect of the diarrhœa, the pigs soon look unthrifty, the coat is dry, and the back arched. The animals eventually die in an emaciated condition. At times some recover and put on condition, but a young pig that has been affected generally remains stunted in growth. Some animals die within a week of the first symptoms noticed, others may be sick for some weeks before death.

The disease when it first appears in a piggery is not diagnosed until *post mortem* examination is made of one or more animals, when the necrotic changes referred to earlier in this article will be found.

Treatment cannot be considered satisfactory in this country, since the pigs when recovered have received such a set back in their growth that they can only be raised at an economic loss.

Prevention and Control.

The disease usually occurs in piggeries kept under bad hygienic conditions, where the pig yards and pens are insanitary and dirty, and the yards small, overcrowded, and filthy.

(*a*) All animals dead of the disease should be burned.

(*b*) All sick pigs should be isolated at once. If seriously affected they should be killed and burned.

(*c*) If it is desired to try to fatten apparently recovered pigs they should be kept in isolation and sold only for slaughter.

(*d*) Pigs in contact with diseased animals should not be allowed to mix with known healthy pigs for at least three weeks after contact with the diseased animals.

(*e*) All pigs newly received on the farm should be kept in isolation for at least three weeks before being placed with other pigs.

(*f*) All sties and pens which have housed sick pigs should be thoroughly disinfected. If not of solid construction, they should be burnt where they stand. The yards should be ploughed or dug up, limed, and a green crop sown. Where the sties are well built and too good to be destroyed by fire, they should be thoroughly disinfected by scorching all over with a brazing lamp or thoroughly washed with a 5 per cent. solution of disinfectant. Floors should be scalded with boiling water and

* In the "Agricultural Gazette" of New South Wales.

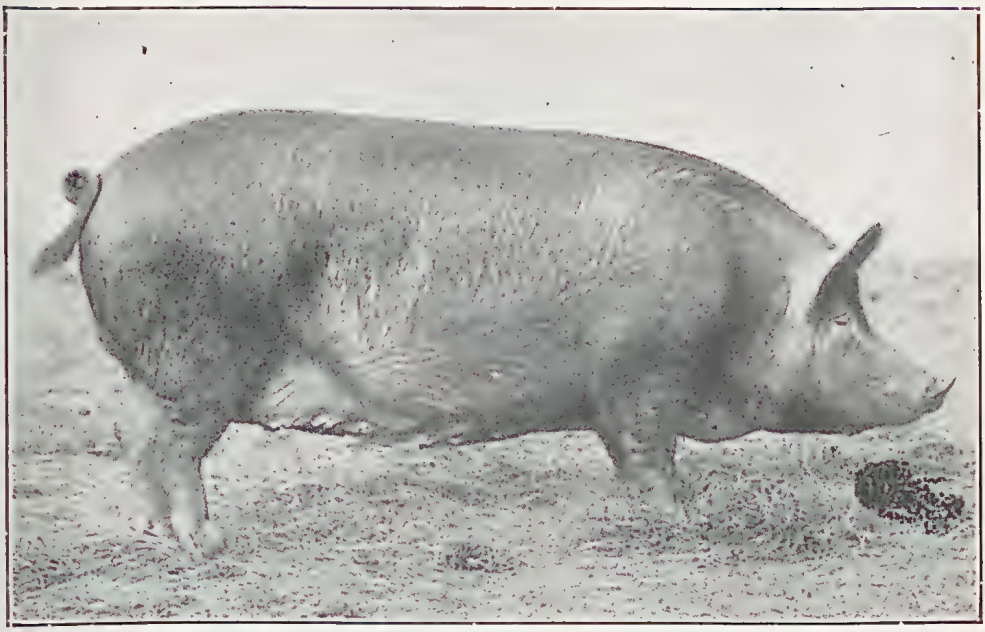


Plate 35.—Tamworth Sow, "Basildon Barbara."

First Prize at the Royal Counties Show, Windsor, England, 1924.

The improvement of the Tamworth breed still continues. Note this sow's quality, her even, well developed body, the length, depth, and width of the ham, and the fine quality mellow skin and silky hair—all evidences of careful breeding, feeding, and selection. She won in keen competition at the Royal Counties Show, Windsor, England, last year.

Plate 36.

The object of the picture is to show a fault—viz., the tongue protruding from the side of the mouth, a very serious deformity in many of our best breeding sows. This sow was a well-known Prize Winner years ago when judges did not realize the serious nature of this peculiar weakness.

treated with quick lime. Wooden feeding-troughs should be burned. Concrete and iron troughs should be well disinfected with a 2 per cent. solution of washing soda in boiling water. All litter should be raked up and burned.

(*g*) Where practicable a new piggery should be erected on a fresh site, and care taken that only healthy pigs are introduced.

(*h*) Being scheduled under the Stock Diseases Act in New South Wales, the occurrence of this disease in a piggery must be reported to the local Inspector of Stock.

CITRUS CULTURE.

THE CONTROL OF PESTS.

By R. L. PREST, Fruit Inspector.

Every citrus grower has to consider his own grove as an independent experiment station if he hopes to get the very best results out of his investment. There is no expert living who can lay down general rules for the production of citrus fruits which will apply equally well in all localities. The grower must assume some of the experimental duties.

In the control of pests 50 per cent. of the result rests upon the application of the fumigant or spray. To effect this it is essential to have the best and most up-to-date appliances, using judgment in applying the remedy at the time most certain to obtain the highest percentage kill. The scale insects have two main hatching-out periods, and best results are obtained by directing the attacks when newly hatched out. Roughly speaking, these periods are November and February, but vary in different localities and with local weather conditions. It is important that growers should study pests and apply the remedy at periods when the best results will be obtainable. Therefore, measures must be taken to combat the pests systematically.

Fumigation.

Fumigation is the surest method of dealing with all breathing and scale insects excepting the Orange-tree Bug *Oncoscelis sulciventris* Stol. Cyanide gas does not, however, kill fungi. Spraying must be resorted to in dealing with this class of pest. This method of control is not practised enough in this State, chiefly owing to the high cost of equipment. To obtain the best results, a string of tents must be used, and some experienced person in charge of the crew, thus ensuring high efficiency at a minimum cost.

Spraying.

Spraying with specific washes for specific diseases is another and perhaps the most common method used to control pests, the reason being that at time of application it is the cheapest method though not necessarily the most economical. To successfully carry out spraying as a method of control, the utmost care must be exercised in applying the material, so that it covers every part of the tree. Spraying machines capable of throwing a high pressure spray are necessary for this class of work. The writer experimented over a period of years with power plants, and found machines throwing a spray at a pressure of 300 to 350 lb. per square inch with a tank capacity of 200 to 300 gallons of solution most efficient and economical. Such a machine may be comfortably drawn by a two-horse team with equal success on hillsides, terraces, and flats.

Carrying out the work of controlling these pests involves an outlay of a considerable amount of capital to the individual grower. A big saving can be effected if co-operative methods are adopted and the work carried out more efficiently and economically. The majority of commercial orchards in the various districts are well situated to adopt this plan.

In forming a co-operative body and purchasing the necessary equipment for fumigating and spraying the cost is borne by a number of growers, and consequently no individual has a large capital standing idle in the form of expensive equipment. The person in charge of the outfits quickly becomes expert at handling his gang and doing the work with the greatest efficiency and at a minimum cost. There is also a good scope for contract work with a reasonable assurance of a good return from the labour and money invested in equipment to anybody doing this class of work as a side line.

General Notes.

The Canary Seed Board.

An additional paragraph has been added to the Order in Council constituting the Canary Seed Board. This paragraph provides that the Canary Seed Board may give security, by bill of sale or otherwise, over any canary seed delivered to the Board in respect of any advance made to the Board for the purpose of the Primary Products Pools Acts.

Sanctuaries for Native Birds.

The land surrounding the Moreton Freezing Works has been declared a sanctuary for native animals and birds, and in connection with such sanctuary, Messrs. M. L. Moss, S. M. Letts, S. L. Stanley, Wallace Maskey, and Wentworth Maskey have been appointed officers under the Animals and Birds Acts.

Friday Island, in the Torres Strait, has also been declared a sanctuary for native animals and birds.

Levy on Pineapple-Growers.

In pursuance of the provisions of the Fruit Marketing Organisation Act, the Committee of Direction of Fruit Marketing has been empowered to make a levy on pineapple-growers in Queensland for the year ending 25th January, 1926, the amount of such levy to be expended only in the interests of the pineapple section of the fruitgrowing industry of Queensland. The levy will be at the rate of 1d. per case of pineapples in containers and, where pineapples are sold loose, at the rate of 1d. per thirty rough or Ripley pineapples, and at the rate of 1d. for every twenty-four smooth pineapples. The levy will, in the first instance, be collected by agents and others who hold to the credit of pineapple-growers such levy money on account of the sale of pineapples, and all levies so collected shall be paid fortnightly to the head office of the Committee of Direction of Fruit Marketing, Turbot street, Brisbane. If the levy is not collected by the agents, then the amount will be payable by and recoverable as a debt from the pineapple-grower.

Agents and others who receive for sale on commission pineapples from pineapple-growers shall, at reasonable times, permit an authorised officer of the Committee of Direction to inspect such of their books, accounts, records, and other documents as may be deemed necessary in connection with the payment of the levy.

Any pineapple-grower or agent who fails to pay the levy or commits a breach of these Regulations shall be liable to a penalty not exceeding £20.

Staff Changes and Appointments.

Mr. W. H. Franklin, of the Department of Agriculture and Stock, has been appointed Acting Clerk and Private Secretary to the Minister for Agriculture, and Mr. F. T. Gibney, also of the Department, has been appointed Clerk, Brands Branch, Department of Agriculture and Stock.

Messrs. J. A. Kidd, H. C. S. Griffin, and C. B. P. Bell have been appointed Government Representatives on the Windorah, Clermont, and Mitchell West Dingo Boards, respectively, and Messrs. A. Mackay, J. M. Howatson, T. L. Armstrong, and W. Avery have been elected members of the Mitchell West Dingo Board.

Constables J. M. Lyons (Jundah), R. Bowler (Wooroorooka), and Sergeant A. E. Shersby (Southport) have been appointed Inspectors of Slaughter-houses.

The following transfers of Inspectors of Stock have been effected:—

A. G. Beck, Gladstone to Helidon;
P. P. Comiskey, Jundah to Gladstone;
J. P. Dowling, Kingaroy to Toowoomba;
J. Gunne, Cunnamulla to Boonah;

and the Gladstone District has been assigned to Stock Inspector W. H. Crank, *vice* A. G. Beck, transferred.

Mr. A. M. Thorburn, Clerk in the Department of Agriculture and Stock, has been appointed an Inspector under and for the purposes of the Diseases in Plants Acts.

Weed Taint in Milk.

A correspondent writes:—"We have found that certain cows are prone to give tainted milk. We have put all these out of the yard and have had no weed taint in our butter for three years. As this information may be useful to others, it is accordingly passed on."

Prices for Cotton.

An Order in Council has been approved, acquiring for the Crown all seed cotton now in Queensland, and which may be grown in Queensland before the 31st August, 1925, and a Proclamation issued declaring that the period during which the Crown guarantees a price for seed cotton shall be from the 22nd January, 1925, to the 31st August, 1925.

The prices to be paid for all such cotton (free from excessive dirt, leaf, and stain, and is not damaged by weather, insect pests, or disease) have been fixed by Regulation, and are as under:—

A Grade—Annual—Five and a-quarter pence per lb.
Ratoon—Three pence per lb.

B Grade—Annual—Five and a-quarter pence per lb.
Ratoon—Three pence per lb.

C Grade—Annual—Five pence per lb.
Ratoon—Three pence per lb.

D Grade—Annual—Four pence three farthings per lb.
Ratoon—Three pence per lb.

E Grade—Annual—Four pence halfpenny per lb.
Ratoon—Two pence three farthings per lb.

F Grade—Annual—Four pence per lb.
Ratoon—Two pence three farthings per lb.

G Grade—Annual—Three pence halfpenny per lb.
Ratoon—Two pence halfpenny per lb.

Immature and Spotted Grades.

1X Grade—Annual—Four pence three farthings per lb.
Ratoon—Three pence per lb.

2X Grade—Annual—Four pence farthing per lb.
Ratoon—Two pence three farthings per lb.

3X Grade—Annual—Three pence halfpenny per lb.
Ratoon—Two pence halfpenny per lb.

(The above grades are those of the Universal Standards for American Upland cotton, of which samples are kept at the Office of the Department of Agriculture and Stock, Brisbane.)

The decision of a grader appointed by the Government shall, in case of any dispute, be final as to whether any cotton comes up to the standard. The weights determined at an authorised factory shall be accepted unless satisfactory evidence to the contrary is produced. An officer of the Department of Agriculture and Stock will supervise the weighing of all seed cotton at each ginnery.

Every bag or other container of seed cotton must be branded by the grower prior to despatch to a ginnery, with the word "Annual" or "Ratoon," as the case may be, in letters not less than 2 in. in height, and must bear the name and address of the grower. Ratoon and Annual seed cotton must not be placed in the bag, nor must different grades of cotton be placed in the same bag. On consigning the cotton, the grower must inform the manager of the ginnery to which the cotton is being sent as to the following particulars:—

Full name and address of grower;
Name of railway station or port of consignment;
Date of consignment;
Number of bales or bags of annual cotton;
Number of bales or bags of ratoon cotton;
Marks on bales or bags.

Every ginnery will be required, on each alternate day, to furnish to the Under Secretary, Department of Agriculture and Stock, a return showing the full name and address of every grower from whom seed cotton has been received, together with particulars as to the number of bags, weight, &c., and any other information the Minister may desire.

Any person guilty of an offence against any of the above Regulations will be liable to a penalty not exceeding £50.

The Slaughtering Act—Additional Regulation.

A Regulation has been issued under "*The Slaughtering Act of* 1898" which provides an effective method for disposal and treatment of certain dead stock and "downers." The carcass of any stock which has died or been killed is prohibited from entry or treatment in a slaughter-house, but may be consigned to a boiling-down establishment.

No meat shall be sold or exposed for sale unless slaughtered at a licensed slaughter-house or public abattoirs.

It will be necessary in future for an owner or person in charge of travelling stock, and in the case of stock travelling by rail, the consignee, to notify the nearest inspector of slaughter-houses or police officer in writing of any stock which have died or been killed prior to arrival at the end of their journey. A penalty of £50 is provided for non-compliance with this Regulation, and in addition any slaughtering license held may be forfeited.

An additional provision is made to prohibit the use or sale for human consumption of tallow obtained from the carcasses of all stock which have died or been killed prior to arrival at a slaughter-house or boiling-down establishment, and it is made a condition of every license granted that a breach of this provision may lead to the cancellation of the license.

The Dairy Produce Act—Testing and Grading.

Regulation 3 of the Regulations under the Dairy Produce Act has been repealed and a new Regulation issued in respect to persons who wish to test or grade milk and cream at a factory. Every such person is required to pass an examination in testing or grading, as the case may be, and will then obtain a certificate of competency signed by the Under Secretary and the Examiner. The subjects of study are as under:—

Milk and Cream Testing.

1. Elementary knowledge of the secretion of milk and factors which influence the same.
2. The composition of milk and cream and factors which induce variations therein.
3. Estimating by the Babcock method the quantity of butter-fat in milk and cream from weight and volume of samples.
4. Errors which may occur in testing, and how to correct or avoid the same.
5. Estimating solids in milk.
6. The collection of samples and means of preserving the same.
7. Recording and computing results of testing.
8. Methods of testing for acidity, moisture, and preservatives.
9. The overrun and factors which influence it.
10. The legislative measures in the various States.

Text-books recommended for study are—Vanslyke or Farrington and Woll.

Milk and Cream Grading.

1. Elementary knowledge of the secretion of milk and factors which might influence the quantity and quality of the same.
2. The composition of milk and cream and factors which induce variation therein.
3. The collection of samples and means of preserving the same.
4. Methods of testing for acidity, moisture, and preservatives.
5. Elementary knowledge of dairy bacteria, their development, and their influence in milk and cream.
6. The neutralisation and pasteurisation of milk and cream.
7. Temperatures—their influence in the treatment, manufacture, and storage of any dairy produce.
8. The causes affecting the quality of milk, cream, butter, cheese, or other dairy products.
9. Grading milk and cream.
10. The dairy legislative measures in the various States.

Text-books recommended for study are—Hunziker's "The Butter Industry," or McKay and Larsen's "Principles of Butter Making," 3rd edition; McKay's "Principles and Practice of Cheddar Cheese Making"; Vanslyke's "Cheese Making"; Jensen's "Dairy Bacteriology."

The Coming Cotton Crop.

The Minister for Agriculture (Hon. W. N. Gillies) stated recently in reply to an inquiry regarding a forecast of the 1925 cotton crop, that a large number of cotton-growers had apparently failed to register, with the result that it was difficult to obtain reliable data on which to base such a forecast. He therefore wished to point out that it was necessary that all cotton-growers should register, and further that payment for cotton forwarded by unregistered growers to the ginneries would be held up pending the effecting of the necessary registration.

Dehorning of Dairy Cattle.

The dehorning of calves is best accomplished by the application of caustic to the horn "buttons," the two small protuberances which can be felt when the animal is a few days old on either side of the poll where the horns emerge. The skin immediately surrounding each button should first be protected by smearing it with vaseline, and the button itself then carefully rubbed with the caustic pencil. Should the caustic touch the skin severe burning will occur, and areas of skin will slough off. For the same reason, the caustic must not be handled with the fingers, but slipped for use into some metal holder, such as an ordinary pencil-holder. Four applications are usually sufficient, when the buttons will peel off, this marking the completion of the treatment.

The operation is thus performed without any pain to the animal, and the method is quite the most effective and humane. Adult cattle are sometimes dehorned by use of a special instrument, several kinds of which are on the market, but it is a painful operation and is not recommended.

If cattle prove troublesome in the yard by horning others, much damage can be prevented by sawing off the ends of their horns, leaving them quite blunt. Care should be taken not to remove too much of the horn, and the sawn ends should not be filed round.—MAX HENRY, Chief Veterinary Surgeon, New South Wales.

Further Experiments in the Storage of Lemons.

A suggestion by Mr. H. Fester, Kenmore, *viâ* Goulburn, that lemons might be preserved by coating them with a casein and lime paste prompted the carrying out of further experiments in the storage of this fruit at Yanco Experiment Farm last season. Casein (4 oz.) and finely-powdered slaked lime (3/16 oz.) were mixed dry, and 24 fluid oz. of water then added, stirring well all the time. The mixture was applied to the fruit with a woollen rag, some of the lemons being afterwards wrapped and some packed unwrapped. A number of lemons were also treated with vaseline, and some packed untreated as checks. The date of treatment was 22nd July, 1924. The fruit was picked (cut) when well on the turn, and sweated for fourteen days. Examination on 23rd September gave the following results:—

Treatment.	Condition when Examined.
Case 1. Vaselined and packed unwrapped	Eight bad. Condition fair.
„ 2. Vaselined and wrapped ..	Two bad. Condition good.
„ 3. Check. No treatment, unwrapped	Sixty-five bad. Condition poor.
„ 4. Check. No treatment, wrapped	Fourteen bad. Condition medium.
„ 5. Smeared with casein and lime, unwrapped	Six bad. Condition medium.
„ 6. Smeared with casein and lime, wrapped	Five bad. Condition fairly good.

Mr. W. W. Cooke, orchardist, reports:—

"As the lemons which were wrapped as well as treated with vaseline or casein and lime kept much the best, the time taken to unwrap, remove the vaseline or casein, and again wrap and pack a half bushel was noted. This was as follows:—Vaseline, 24 minutes; casein and lime, 46 minutes. Purchased in small quantities, casein costs 2s. 6d. per lb. and vaseline 1s. per lb. About 4 oz. of casein would be required to treat a bushel case; the amount of vaseline used would be 2 oz. or less for the same quantity of fruit. The total cost for material and time required to treat and wrap the fruit in the first place, and later to remove the treatment and again wrap and pack would be:—Casein and lime treatment, 3s. per bushel; vaseline, 1s. 9d. per bushel. When large quantities of fruit are being treated, the time required for treatment could no doubt be considerably reduced."—"Agricultural Gazette" of New South Wales.

Get a Good Bull.

If one were to summarise the experience of Kansas dairy farmers in the profitable conduct of their business, it would be expressed in one short sentence: "Get a good bull." It costs no more to feed a good bull than a scrub, and the scrub is a sure money-loser. Nothing will tear down a good herd so fast or so completely as a scrub bull. The descendants of a scrub bull soon cease to be cows in any profitable sense, and become mere walking appetites. If there is a mortgage on the place, the scrub bull will hasten the day of foreclosure, but if one does not have a mortgage and still keeps a scrub bull, he will soon have both.—"Dairying in Kansas."

Soil Analysis and Cropping Practice.

A chemical examination of the soil reveals little evidence as to the proper fertiliser or cropping system to be followed to secure maximum production, say the soil specialists at the New York State Agricultural Experiment Station at Geneva, according to "Better Fruit." The soil is so complex chemically, it is pointed out, that a random sample taken by an inexperienced person is practically worthless as a basis for predicting what a given soil will or will not do. Chemical analysis also shows only the total amount of plant-food present, without giving an accurate estimate of the amount available to the growing crop.

For these reasons, and because experience and investigation have revealed that nothing helpful can come from such analyses, the station soilmen decline to analyse samples of soils sent in by farmers and others who expect to use the chemical tests as a basis for fertiliser or cropping practice.

How Denmark Became Prosperous.

The Danes were once a seafaring, war-making, poverty-stricken people. Now they are agricultural, peace-keeping, and prosperous. How did they do it?

During the Napoleonic wars they sided with the French. The English and Germans beat them. Their navy was sunk; they lost most of their colonies. Germany took all the southern part of their country, which was by far the best part of it. By the latter part of the nineteenth century these defeated, poverty-stricken people were thrown back to make a living out of the poorest land in Europe.

Then what did they do? They did not emigrate to other lands; they did not submit themselves to be ruled by their aristocracy; they did not appeal to their Government to help them. They did a very unusual thing—they helped themselves. They formed an association of neighbours to do things together; they pooled their intellectual power so that everybody in the pool should get the advantage of the best brains; and they settled down to work out their problems on the spot.—"Southern Planter."

Rat Control in Hawaii.

Interesting information concerning the methods adopted for rat control in Hawaii is made available by Mr. David G. Stead, a member of the New South Wales Government delegation to the recent Pan-Pacific Food Conservation Conference at Honolulu. The introduction of the Indian mongoose appears to have proved anything but a profitable measure, the animal having itself become a pest without having proved its efficacy in the way desired. "The consensus of opinion among experienced hands here," comments Mr. Stead, "is that he has proved to be 'a very poor ratter,' while at the same time being a standing menace to poultry and bird life generally." It is appalling to think, he adds, what might happen if those in favour of the animal's introduction in Australia as a means of controlling rats and rabbits had their way.

Some years ago rats began to manifest themselves in something approaching plague numbers in Hawaiian cane fields, and—protected as they were by the forest of cane stems—they multiplied rapidly and began to destroy considerable quantities of the cane itself and of certain fruits. With the failure of the mongoose, mechanical means of control have had to be resorted to on a large scale, while poison is often freely used. A method advocated is the use of barium carbonate baits, the procedure being first to set unpoisoned wheat (in five places to the acre) for a period of about two weeks until every rat and mouse knows where it is, and then to substitute poisoned baits. This is done three times a year, with such success that the 1924 crop of cane harvested at Honokaa (an important plantation) showed practically no rat-bitten cane, and the plantation got fully 60,000 dollars worth of sugar which had hitherto gone to feed the rats. The total cost of the work here has been about 5,000 dollars annually.

Another method of using the poison is to prepare a dough with one part barium carbonate to three of flour, rolling this thin, stamping it into tiny biscuits, and finally drying these and coating them with paraffin.

Whitewash.

Alum added to a lime whitewash increases its adhesive quality. An ounce to the gallon is sufficient. Flour paste answers the same purpose, but a preservative such as zinc sulphate should be added. Molasses renders the lime more soluble and causes it to penetrate more deeply the wood or plaster; a pint of molasses to 5 gallons of whitewash is sufficient. Silicate of soda solution (about 35 degrees Baume) in the proportion of 1 to 10 of whitewash produces a fire-resistive cement. A pound of cheap bar soap dissolved in a gallon of boiling water and added to about 5 gallons of thick whitewash will impart a gloss like that of oil paint. The introduction of a small quantity of crude carbolic acid adds to the whitewash a certain value as a disinfectant.—"New Zealand Farmer."

The Poultry Industry.

Among the rural enterprises of which the Government is not unmindful is the poultry industry. This is an industry sufficiently profitable to be worked independent of other classes of farming, and is also a valuable side line to the mixed farmer, the orchardist, and to most farmers, besides being a profitable hobby to the industrious wage earner.

Egg-laying tests conducted under Government supervision have now been in vogue for several years and have proved of considerable educational value to all poultry keepers. They have also been effective in increasing the productivity of flocks generally by illustrating the possibilities of production and, by their continuation, tend to keep up the general standard. As a protection against the spread of disease and also to assure that only healthy birds are sold for consumption, a Diseases in Poultry measure has been enacted and is now in force. This has proved of benefit to the industry and now it is only on rare occasions that diseased stock are seen in the markets. The general instruction of poultry keepers is provided for by the appointment of a Poultry Instructor, who visits various centres lecturing, demonstrating, and otherwise assisting the industry. In addition, the instructor prepares matter for publication and dissemination among poultry keepers. Other phases of the industry also are now subject to close investigation by the poultry instructor.

An International Institute of Co-operation.

A development of considerable significance in agricultural co-operation is the decision reached unanimously at a meeting of farmers' organisations and co-operative undertakings held at the Department of Agriculture, Washington, U.S.A., and attended by the late Secretary for Agriculture, Mr. H. Wallace, to hold a conference this year for the purpose of founding an International Institute of Co-operation in the United States.

The project is purely educational. In a memorandum setting out the aims and purposes of the Institute, its promoters observe that the general conception of the principles underlying the co-operative movement is vague, uncertain, and idealistic, and that a more thorough understanding of the theory, history, and technique of co-operation is necessary if the successful application of these principles, and the realisation of their acknowledged possibilities for good to the business interests and general welfare of the country, are to be accelerated.

The immediate objects of the conference are stated to be:—

1. To collect and make available a body of knowledge concerning the co-operative movement in the United States and in other lands.
2. To serve as a means of clarifying thought as to what the co-operative movement really is, and of bringing about more harmony and unity of action among organisations directly or indirectly connected with co-operation.
3. To serve as a means of training and developing leaders and workers in respect to co-operative theory and practice.
4. To serve as a means of assisting educational institutions to improve their teaching courses in co-operation.
5. To focus the spirit of the co-operative movement as a means of community and national development.

The session will last about four weeks, and it is the intention of the organisers to invite to America for the occasion the leading authorities on the co-operative movement in various parts of the world, as well as a number of students.—"Journal of the Ministry of Agriculture," London.

A Giant Moth—Habits Described.

A very large moth found at West Burleigh on a peach tree is described by the Government Entomologist (Mr. H. Tryon) as an insect of unusual interest. The finder of the moth says that caterpillars similar to that from which the moth developed have been voraciously eating the leaves of peach trees. Mr. Tryon states that the moth is not of altogether uncommon occurrence here at this season of the year, but that it is very unusual to encounter an undamaged specimen. The one submitted is much battered. The voracious eating of the leaves of peach trees, he says, is a habit quite foreign to its general habits, and one the existence of which has not been even suggested previously.

"It is named *Endoxyla Boisduvali*," Mr. Tryon writes, "the specific name commemorating that of a celebrated French Entomologist—Boisduval—and the generic that it is—at one period of its life—a 'timber insect,' Endos, being Greek for wood, and Xyla, or Xylin sing, Greek for within. It is not altogether a rare insect, but stationary on the bark of the tree, whence it emerges. Its presence is easily overlooked. Then, again, its free existence is only brief, and, moreover, it is a night-flying moth, resorting to the foliage far above ground, as a rule. Of course it exists in the several phases of moth life—the egg, the caterpillar, the chrysalis, and the imago (moth) phase. The eggs are enormously numerous, and these the female insect inserts, by aid of a long ovipositor, usually telescoped within the extremity of its hindbody, into crannies in the bark of a living eucalpyt tree, especially favouring for this purpose in the Brisbane district one that we term grey gum, appearing to prefer the younger trees, apparently depositing very few—perhaps only a single egg—in one tree.

"On emerging from the egg the caterpillar enters the wood, gnawing its way often to the centre of the trunk, and so it feeds downwards until several inches have been gnawed out, as the caterpillar is very large—as bulky, in fact, as the size of the moth would suggest. Moreover, although the entrance to its endoxylic abode may be protected by webbing into which are woven woody particles, still wet, and moisture can gain admission by the channel it effects, and thus young trees may be seriously injured owing to its attacks, for this habit of feeding may be prosecuted for nearly twelve months. Eventually, during November, December, or even earlier in the spring, the caterpillar transforms to a chrysalis a short way in from the entrance to its abode, and after a period of not many days have elapsed it becomes a moth again—male or female, as the case may be, the representative of the former sex being the smaller. As a moth, it is associated, with others, in the family Cossidae. These moths must represent as it were the prototypes of all lepidopterous (*i.e.*, scaly-winged butterflies and moths) insects, and had representatives in existence long before the majority of other types now living came into being. Amongst the epicures of ancient Rome, one of the greatest delicacies was a roasted Cossus caterpillar, merely termed 'Cossus'—one that for size and flavour bore no comparison with our Cossus caterpillar (*Endoxyla Boisduvali*) or even with that which may be met with in the wood of more than one local wattle (Acacia) species. Moreover even to-day the indigenous people of Australia, the survivors of a type of people that rocked the cradle of humanity, consume these luscious insects with avidity, and, once being forced by circumstances to be partakers of their hospitality, and the sharers of their frugal board, I can testify to the fact that their judgment in this respect as to what constituted a delicacy in the matter of food could not otherwise than merit one's approval. True they roasted them fixed in the fissure of a split piece of wood. Had they been Maoris, however, they would have killed them and masticated them in one act. The moth itself during its short life partakes of no food. In fact, it has not the usual mouth organs of other members of its tribe. In its past existence as a caterpillar it consumes aliment enough to sustain it when it takes on its organs of flight."

The Goliath Phasma—Giant of Its Tribe.

Mr. C. E. Kingston, of Samford, has submitted an insect to the Government Entomologist (Mr. Henry Tryon), who supplied the following notes:—

This strikingly handsome insect—a giant of its tribe, measuring 8¼ inches in length and with a wing expansion of nearly that extent—is known as the Goliath Phasma—technically *Cyphocrania goliath*—the generic term having reference to its swollen head. When at rest, with its short leaf-like forewings and the exposed portion of its elongated radially folded hind ones, alike finely net-veined and grass green with elongated white markings, with its long white ringed green hind body and its attenuated thorn-bearing twig-like legs, it would seem—and being so large, too—a strikingly conspicuous insect; but in life it is wont to repose amongst the foliage of one of our tall eucalypts, and, moving but seldom, so well does it harmonise with its environment—in form, colour, and livery—that its detection there must be difficult, even to its foes the birds—especially those grey cuckoo shrikes *Graucalus* spp.—that

show such a destructive partiality for it. Especially is this so when it is immature, for lacking its wings now it looks in fact like a series of branchlets of the tree it is upon. Further, this mode of life seems to account for the apparent scarcity of the insect, those encountered having evidently been brought low by high winds, or perhaps through being assailed by their bird-enemies referred to.

The insect is a member of the Phasma family—one sometimes spoken of by our youth as the "Native Lady," its general beauty being enhanced by the delicate transparent glistening portions—the greater ones of the hind wings, exposed when these are expanded, and it is volplaning. It is a truly leaf-eating insect, and since it occurs upon some gum tree and is never gregarious, it is, as your correspondent remarks, perfectly harmless, not having the prehensile raptorial forelegs and powerful mandibles of one of the mantis family of the Orthopterous insect, with which, however, it has some systematic affinity. I am not aware of its having ever been reared to maturity from the eggs, but the young "giant" on issuing therefrom is a very attenuated, long-legged insect, giving but little indication of what it is to be in after life. Moreover, these eggs themselves are singularly strange-looking objects, more like the large seeds of some leguminous plant than what they really are. They are oval in form, measure rather more than 3½ lines in length and two in width. What appears to be their shell is remarkably thick, and is of open texture. But it is really a hard investment of the egg proper, being a representative, in fact, of the dry spume that composes the massed egg capsules of the mantis, or that protective—also frothy—substance that fills the egg-chamber of the grasshopper or locust. These eggs, in the case of the Giant Phasma, are disseminated singly in a very casual manner, being apparently dropped on the ground without any choice of location. In this proceeding the mother insect is aided by a peculiar elongated pointed green organ that terminates its hind body; and that, being meantime bent upwards and concave above, acts as a scoop for holding these ova. Large as is this Goliath Phasma it is not the biggest of its class that is met with here in Southern Queensland. One that is termed the Titan easily exceeds it in size. Neither, again, is it the most beautiful of our "Native Ladies." In some Phasmas, indeed, we have the transparent hind-wings rose-pink, others with them purple, or again ones with them red—colours contrasting pleasingly with the brighter green of their more elegantly formed bodies. It is only those, however, who cherish the native haunts of our rarer insects to whom these beauties are revealed.

Preserving Posts.

Creosote, which is a coal tar product, is universally regarded as the very best wood preservative. It is widely used in practically all countries for preservation of sleepers and piles. The cost of this preservative prohibits its use in connection with cheap materials, unfortunately. Coal tar is far cheaper than creosote and is used on a small scale. It penetrates wood with difficulty, even when hot, and leaves a stick surface. While it has a preservative value, it does not compare successfully with other preservatives. Next to creosote comes zinc chloride as a most popular preservative. It ranks high in toxic qualities against decay and insects, and its cheapness in price is a very important consideration. Creosote costs over 3s. per gallon, coal tar in the neighbourhood of 2s. per gallon. It is customary to use a 5 per cent. solution with this salt, aiming at an absorption equivalent to half to three-quarter pound of salt per cubic foot. The most of zinc chloride amounts to 3d. to 4d. per cubic foot, which is a very reasonable expenditure and well justified even with ordinary posts. Whichever preservative is used it is important to season the poles from six to nine months prior to treatment in order to get them thoroughly dry. One 90-gallon drum (3 feet 3 inches high by 2 feet 3 inches diameter) with one end removed, will serve as a treating tank, and it may be placed on stones in such a manner as to allow a fire to be built under it for heating the preservative. The temperature of the preservative should be kept slightly under the boiling point, and the poles allowed to remain in it from three to six hours, depending on the species and the sizes of the poles treated. At the conclusion of this period, it is desirable to transfer the poles directly into a similar tank containing cold preservative for one or two hours, as this causes deeper penetration. The tops do not require as thorough treatment as the butts. Fence posts may be turned upside down in the tank for a short time, and longer poles would be brush treated. The number of tanks required for any particular job should be determined by the number of poles to be treated.—"New Zealand Farmer."

The Adaptability of Barley in Live Stock Feeding.

As a utility feed for live stock, the value of barley is generally accepted, but its particular value in this respect is less fully appreciated. Barley, like corn, is a carbonaceous feed, and, generally speaking, it may successfully be used to replace corn in the rations. When fed alone it is open to criticism because of its lack of

palatability as compared with oats, corn, or wheat; but when fed in grain mixtures this objection is negligible. It is rather heating in character, and because of this must be fed with discretion to such classes of stock as idle work horses and pregnant brood sows, if used at all.

When fed in an experimental way to work horses it was not consumed with the same relish as oats, nor did it possess as high a food value. The difference in this latter respect was, however, comparatively slight.

For the feeding of steers or beef cattle barley has a high commercial value. In a test conducted at the Brandon Experimental Farm, in which barley and frozen wheat were compared, the barley chop gave an average daily gain per steer of 1 lb. 13 oz., while the frozen wheat gave a gain of 1 lb. 3 oz. At the Indian Head Experimental Farm, in a test covering a period of seventy-seven days, barley was compared with elevator screenings. The barley-fed lot made an average daily gain per steer of 2.18 lb., while the screenings-fed lot made a gain of 1.78 lb. Barley also holds a prominent place in the meal ration of dairy cattle.

The suitability of barley for bacon production has been repeatedly demonstrated by the Dominion Experimental Farms, particularly for finishing. It is not a desirable feed for brood sows before farrowing or during the early part of the nursing period, but may be introduced into the sow's ration after the pigs are a week or two of age. Because of its carbonaceous nature it should not be fed to newly-weaned pigs in any appreciable quantity but find its chief use in the rations of bacon hogs after they have attained the age of about three months. At this time it may safely be introduced and gradually increased until it comprises upwards of 50 or 60 per cent. of the meal ration as the hog approaches marketable weight.

In comparison with corn for the feeding of market hogs it has given 0.11 of a pound lower daily gain per hog and cost 0.26 of a cent more per pound of gain in feeding tests recently conducted at three Dominion Experimental Farms in Eastern Canada. The deductions drawn from these tests with swine were as follow:—(1) That bacon hogs are capable of making slightly greater gains on corn. (2) That pound for pound, barley has a slightly lower feeding value than corn. (3) That barley-fed hogs are more evenly fleshed. (4) That barley-fed hogs give a superior quality of bacon. (5) That home-grown barley can be fed more economically than corn (generally an imported feed).

It might be well to emphasise the importance of using home-grown feeds for economical production under present market conditions. Barley can be universally grown, is a relatively heavy yielder, and is particularly well suited for adding to the rations of cattle, sheep, and swine where a carbonaceous feed is required.—W. G. DUNSMORE, Assistant Animal Husbandman, in "Seasonable Hints," Canadian Agricultural Department.

Trees as Fertilisers.

The French agriculturist takes from an acre of land more food than is harvested by the average farmer of any other Caucasian nation, yet most of the roads of France are bowered with trees. Thus is contradicted the Australian notion that a tree must starve adjacent crops. In a field of cereals, one may expect to find dwindling growth under the trees, yet it is questionable whether economic culture should decree the absence of all timber, except shade leafage, from the farm. Evergreen trees may be a drag upon yield of the soil, but deciduous trees furnish manure for coming crops. Wide advertisements should be given to a test of adjoining acres, one carrying no timber, and the other having a deciduous tree in its centre. Collection of shed leaves would annually enrich the one acre, whilst the other received no return of nitrogen. Until such a test is published, most farmers will jump at the conclusion that purchase of chemical manures would be cheaper than the labour costs of leaf gathering. Still exact figures should be available. In England, where leaves for the muck heap are highly valued not half the autumn supply is gathered. The major part rots, and is diffused over the district as leaf dust, thereby its benefits vanish from the ken of men. Yet the enrichment of the soil is there, although it cannot be measured by scientists. The tree extracts a virtue from the soil much deeper than that which feeds annuals. Farmers in Europe who pay crushing rents do not tolerate the presence of trees for their scenic value. Before we can measure the service of drifting leaf dust, a whole district must have all farm boundaries lined with trees of fully ten or twenty years' growth. Still, as introduction to a possible wide spreading benefit, farmers should be convinced that the manure value of a deciduous tree is generous repayment for the crop shortage of the preceding season. Twenty years of waiting to learn to truth of manure values may represent a long order. Nevertheless the profit and loss account of trees for manure-supply deserves careful investigation.—Bay Webb in "The Countryman."

Essentials of Good Milking.

The essentials of good milking are that it should be performed quietly (that is, with no discomfort to the cow), quickly (rapid milking appearing to increase the flow), and thoroughly—the last milk, being the richest, should always be withdrawn. In the milkers' contest at the London Dairy Show, in which no competitor is allowed to milk his own or his employer's cows, the following are the judging points:—(1) Manner of approaching the animal and style of work, 20 points; (2) cleanliness, 10 points; (3) clean stripping, 10 points; total, 40 points.—"British Ministry of Agriculture."

Australia on the Film.

A recent private view was given at Brisbane of the Commonwealth Government picture, or series of pictures, embracing many of the most fascinating scenic sights in Australia, the nation's industries, and to a great extent the life of the people. An explanatory introduction was given by Captain J. Francis, M.H.R., who stated that the pictures were similar to those which the Government was forwarding to England for propaganda purposes. In Australia, the city man as a rule, he said, knew his own city, and perhaps one or two of his favoured holiday resorts, while the horizon of the farmer extended very little beyond his own particular district. Sections of the series of pictures would be released each week.

Among the invited guests were the Governor (Sir Matthew Nathan), the Lieutenant-Governor (Hon. W. Lennon), Archbishop Sharp, Archbishop Duhig, the Premier (Hon. E. G. Theodore), the Deputy Premier and Minister for Agriculture and Stock (Hon. W. N. Gillies) and other Cabinet Ministers, Mr. A. E. Moore, M.L.A., and the Chief Justice (Mr. T. W. McCawley).

The pictures were beautiful and impressive, and lacked nothing in technical quality. Spectators were taken, so to speak, on a trip through bush lands and pleasure resorts, and then into the rich pastoral areas of Queensland, where thousands of cattle basked and browsed along the river bank. The onlookers were next shown station life, and sport outback. The view of a big meatworks, with its tons of modern electrically-driven machinery, sawing, measuring, weighing, and freezing, was very interesting. The pictures comprehended scenes, incidents, and industries in most of the States, and they no doubt will serve their purpose well as a medium of enlightenment and education. They were produced under the direction of Captain Lyn Maplestone, M.C., Secretary of the New Settlers' League (Queensland Branch).

Mr. Scriven Honoured.

Reference to the recent retirement of Mr. E. G. E. Scriven from the position of Under Secretary for Agriculture and Stock was made by Mr. John Macdonald at the last meeting of the council of the Royal National Association. Mr. Macdonald said that during the forty years Mr. Scriven had been Under Secretary, the National Association had been in close touch with him and his department. For twenty-six consecutive years the Department of Agriculture and Stock had made an exhibit at the annual show, and the association was under a deep debt of gratitude to the department for its consistent efforts to bring forward and show a worthy exhibit of Queensland products. He thought it would be a graceful recognition of Mr. Scriven's services if the association granted him an honorary life member's ticket. The chairman (Mr. W. J. Affleck), in endorsing the suggestion, said the rules of the association provided that appointments of honorary life members could be made only at a general meeting. It was decided to recommend to the next annual meeting that Mr. Scriven be made an honorary life member of the association.

Nervous Temperament as Applied to the Cow.

The term "nervous temperament," when applied to the dairy cow, does not mean that she is excitable or hard to handle. It only means that she has a strongly-developed nervous system, which enables her to respond to the long-continued and heavy demands made upon her in the production of both dairy products and her own off-spring. It is in contrast with the "lymphatic temperament" so valuable in the beef animal, where a sluggish disposition with an inherent tendency to convert feed into body fat is of prime importance.

The steer deposits fat upon his own body because of a lymphatic temperament, and the dairy cow deposits her fat in the milk because of a nervous temperament. They may both eat the same feed, but they make different uses of it. This is a most important distinction, because occasionally individuals within the dairy breeds have a lymphatic temperament, and while they will not lay on flesh as does the beef-bred animal, they are not satisfactory in the dairy herd.

A cow that is broad between the eyes and has a long, broad forehead gives evidence of large brain capacity. This, supplemented by large, prominent, bright,

and intelligent eyes, accompanied by rather small and refined spinal processes as indicating a relatively small spinal cord, is good evidence of nervous temperament. There are other indications: freedom from beefiness, absence of sulplus body fat, and extreme angularity of form, with great prominence of hip bones and ribs.

Activity and an alertness to her surroundings would also indicate that the cow is a worker from the dairyman's point of view; and her general deportment is worthy of lengthened study even after an inspection has shown her to possess other desirable qualities. It is only by such study that her disposition to work or not to work can be determined.—"Agricultural and Pastoral Notes."

The Function of Agricultural Science.

The nineteenth century took the view that agricultural science was justified only in so far as it was useful. That view we now believe to be too narrow. The practical purpose is, of course, essential; the station must help the farmer in his daily difficulties—which necessitates co-operation between the practical grower and the scientific worker. But history has shown that institutions and investigators that tie themselves down to purely practical problems do not get very far; all experience proves that the safest way of making advances, even for purely practical purposes, is to leave the investigator unfettered. Our declared aim at Rothamsted is "to discover the principles underlying the great facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts, and farmers for the upraising of country life and the improvement of the standard of farming.—Sir John Russell, Director of Rothamsted Experiment Station, in a recent address at Toronto (Canada).

Robbing by Bees—Interesting Observations.

One scientific discovery frequently leads to further information being brought to light, and a close investigation at the Government Apiary at Wauchope, N.S.W., recently of the transference of honey from one bee to another for the completion of the ripening process disclosed the fact that transference takes place apart from direct association with the ripening process.

A medium-sized swarm had been hived at the out-apiary, and the bees allowed to settle down. Seven frames of broods were then given this swarm colony, the idea being to form seven queen-rearing nucleus colonies. The colony was transported to the home apiary and immediately divided, each nucleus being given a ripe queen cell. The weather conditions had been adverse, rain having fallen for five days so continuously as to prevent the bees in the main apiary obtaining anything from the fields. Very little inducement would therefore be necessary to start robbing, and it was for this reason that the swarm colony from the out-apiary had been selected, as in such event they would protect their home well.

After forming the nuclei from the swarm colony there were still three frames of foundation with a good number of adhering bees left, and these bees were shaken in front of each nucleus. Most of them had entered their respective hives when robber bees were noticed to be about. It was decided, although there were a few bees about the hives, to put grass in the hive entrances to minimise any risk of robbing. The action of the bees outside the hives attracted attention, and the first impression was that they were transferring honey from one to the other. It soon became evident, however, that robber bees were busy relieving the young bees of their honey-sac supplies. The robbers knew their mark well, and would proceed in a very determined manner to demand the young bees' supplies. It was not uncommon to see as many as three and four robbers operating on the one victim, the latter usually a bee of not more than about six or seven days of age. The action of the robbers was similar to that observable during transference about the hive entrance during the honey flow, though there was more excitement, of course. This robbing of the young bees caused quite a little commotion, and had there been a large number of young bees some trouble would have been caused.

Next morning at 5 o'clock another very interesting aspect was observed. The grass from the nuclei entrances had been removed the previous evening, and the bees were just getting about. There were a few robbers flying, and it was decided for the time being to replace the grass. Several bees were again shut out and again molested. It was noticed that sometimes while a robber was demanding by its actions the supplies of a young bee, or while busy at this robbery, it would itself be attacked by a bee from the nucleus. This went on for some time, the robbers taking every opportunity to molest the young bees, while others from the hive came to the young bees' assistance and drive the robbers away.

The young bees—in fact, all the bees in the colony brought from the out-apiary for the forming of the nuclei—would, after the shaking up in transportation, have well-filled honey-sacs. The robbers took advantage of this, knowing, no doubt, that when a supply is demanded of a young bee it will be given up. It is evident from

these investigations that robbing tendencies can be induced not only by leaving honey accessible, but also by leaving young bees available to the robbers. Had the nuclei been weak ones, or had care not been taken to prevent undue excitement, there would have been trouble.—W. A. GOODACRE, Senior Apicultural Instructor, N.S.W.

Milk Veins and Production.

The so-called milk veins which extend forward from the udder on the abdomen of the cow are not milk veins at all, but blood veins. This fact does not detract from their value in judging the quality of the cow, as their size, length, and convolutions serve to determine the quantity of blood which flows through the udder.

Leading forward from the udder, these visible veins terminate in so-called milk wells, which are orifices in the abdominal wall where the veins re-enter the body. The size of both the milk veins and milk wells is large in large-producing cows and small in those of smaller production. The veins are also very crooked in the large producers and may have many branches, with as many milk wells. Because of the very close relationship between the blood supply and the amount of milk produced, the size and convolutions of the milk veins, with the corresponding size of the milk wells, is accepted as a very excellent index of the producing capacity of the cow.

Sometimes these milk veins extend as far forward as the shoulder pits and have numerous branches and milk wells. At other times the veins are small and short, with but few milk wells. The cow with the extended system of milk veins is usually a large producer. In selecting a cow for large production, it is therefore necessary to see that she has a well-developed system of mammary veins.

System in Poultry Farming.

At the commencement of another year (writes the Poultry Expert of the Department of Agriculture) it would be well for every poultry-farmer to look back and take stock of his position as compared with previous years—then to look forward and make his plans for the next twelve months. The first may not appear an easy matter to the farmer who does not (perhaps cannot) keep account of all his transactions, the egg production of his farm, &c. It is well understood how many poultry-farmers, working under difficulties with indifferent or inadequate equipment, and perhaps under the necessity for improvisation at every point, find themselves so burdened with work that it is almost impossible to keep in black and white all the details they would wish to keep in connection with their business. Hence it is that only a small proportion of farmers know their actual position except in cash at any time. Admitting all this, there are a few particulars that every poultry-farmer should have on record, the keeping of which will not involve either much time or skill in book-keeping.

For instance, if on the 1st of January or thereabouts of each year a poultry-farmer had the following simple information before him, he would be able to summarise the profitableness or otherwise of his business:—

1. The number of adult stock carried during the year.
2. The number of chickens raised.
3. The amount paid out for feed actually used.
4. The income during the year.
5. Additions to stock or plant.
6. The number of dozens of eggs marketed.

This at first sight might appear to many to be a somewhat formidable undertaking. Perhaps it will look less so when a simple method is put forward. After all, it resolves itself into one word, "System."

Take Nos. 1 and 2. In January every poultry-farmer can distinguish his hens from the young stock, and all that is necessary is to count them and record the number. This may be looked upon by some as a big task, but it really is nothing of the kind. Take a farm with 1,000 layers and the young stock in course of rearing; if two persons go the right way about it, they can count them in from two to four hours, according to their disposition on the farm. No. 3 will resolve itself into a matter of adding up the feed accounts, whether booked up or only filed. No. 4 can, if in no other way, be extracted from the account sales received from selling agents. No. 5 might be actual costing, if accounts are kept, and if not, demands only the estimated value of the buildings. No. 6 is also easily extracted from the account sales, but with the addition of the number of eggs consumed by the family or disposed of in any other way.

Such simple data will enable one to find out the weakness or strength of his position. The absence of such a summary has caused hundreds to become disheartened and to abandon poultry-farming, while others have piled up debts they would never have contracted had they been able accurately to assess their true position.

Answers to Correspondents.

Water Storage.

J.S.S. (Beechmont)—

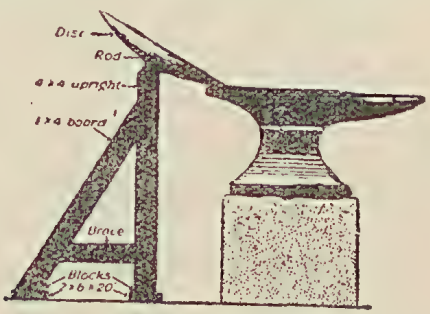
Mr. A. E. Gibson, of the Agricultural Instructional Staff, advises that your plan is quite feasible but expensive. The cost of sufficient storage for water plus elevation of the righer tank would entail a greater expenditure than the cost of a 2 h.p. engine. It would be cheaper to invest in a reliable make of engine at, say, £30 to £35 (2 to 2½ h.p.). Wind is an efficient power when only intermittent pumping is required, but for constant work it is obviously not satisfactory. A 3-inch pipe will discharge 301.35 gallons per minute; 1 inch pipe capacity is 33.14 gallons per minute. A 2 h.p. motor with a 1 inch drive pipe would require a direct fall of 100 feet. Windmill power is fully described by Mr. H. E. A. Eklund, hydraulic engineer, in this Journal for October, 1923.

A MUCH-NEGLECTED VOLUME.

Look on the average householder's bookshelf and what is to be found? A few of the lighter light novels, a railway time-table, a well-thumbed gardening manual, a treatise on hen-keeping for profit on pocket handkerchief plots, and maybe a copy of Shakespeare, which father won as a prize at school, and has never since opened, unless to hide in it a ten-shilling note from mother. If there is any room left on the shelf a few seasoned pipes and a jardiniere possibly occupy it. Yet there is one book which should be on every shelf—the "Commonwealth Year Book"—and that is not written in a spirit of levity. Most folk are astonishingly ignorant about their own country, and a volume containing a mine of information about it lies at the Government printery neglected. No doubt many people would scorn to open such a publication, even if in the last stages of insomnia. "Too dry," they would say, and turn to reading a pamphlet extolling the remarkable virtues of someone's patent cure-all. But, besides the statistics which the Year Book naturally contains, there is a wealth of interesting and historical data. For instance, a summary is given of the more important events in the early history of Australia. As one Melbourne writer said recently: "So little is known outside Australia of this early history that this chapter will come almost as a romance to British readers." He well might have added: "And to Australian readers also." All the primary industries are dealt with, and there is much about forestry, fisheries, and water conservation, and Commonwealth and State finance. For the workers there is information about industrial legislation, hours, wages, and prices.—The "Brisbane Courier."

SHARPENING DISCS.

The disc holder shown will be of value in the small shop. It offers a bearing for the disc so that the disc edge can be hammered out on the anvil, either hot or cold. Since the support consists of only two upright pieces, the feet should be about 20 in. long and these braced with short blocks placed on each side of each upright.



For a Small Shop.

If the disc is not equipped with its bearing the rod may be driven straight into the 4 by 4. If the bearing is in place, this had best be driven into a hole bored for it at an angle. If the rod is not more than three-eighths of an inch in diameter, there will be ample play, however, to prevent inconvenience.

With a machinist hammer the edge can usually be thinned quickly, while the disc is slowly turned, without the use of heat.—"The Queenslander."

QUEENSLAND SHOW DATES FOR 1925.

Feb. 4–6 —Stanthorpe Agricultural Society (A. E. Bateman, Secretary).
10–12—Eastern Downs H. and A. Association, Warwick (H. Sterne, Secretary).
18–19—Central Downs A. and H. Association, Allora (H. G. Deacon, Secretary).
25–26—Darling Downs P., A. and I. Association, Clifton (P. G. A. Murphy, Secretary).

March 11—Oakey A. and P. Society (H. M. Rutledge, Secretary).
19—Goombungee and Haden A., H. and P. Society (J. J. Morgan, Secretary).
24–25—Inglewood A., P. and H. Society (Miss Cheshire, Secretary).

April 1–2 —Dalby P. and A. Association (C. Harvey, Secretary).
11—South Brisbane A., H. and I. Association.
13–14—Herberton M., A. and P. Association (E. C. Wright, Secretary).
15—Pittsworth P., A. and H. Association (B. Binney, Secretary).
16–17—Wondai A., P. and I. Society (G. D. Griffith, Secretary).
21—Milmerran District A., P., H. and I. Association (J. H. Sopp, Secretary).
21–22—Chinchilla A. and P. Association (J. E. Mackie, Secretary).
22–23—Killarney Agricultural Society (Clifford Alford, Secretary).
23–24—Nanango A., P. and M. Society.
28–30—Barcoo Pastoral Society, Blackall (W. P. Tilden, Secretary).
28–30—Toowoomba Royal Agricultural Society of Queensland (G. Noble, Secretary).

May 30, 1 } Kingaroy A., P. and I. Society (J. S. Michen, Secretary).
5–6 —Taroom A. and P. Association (T. O'Malley, Secretary).
6–7 —Central Warrego P. and A. Association, Charleville (W. R. Sinnott, Secretary).
6–7 —Maleny A., I., P., and R. Society (G. B. Sutton, Secretary).
6–7 —Toogoolawah D., A., and I. Association (Douglas Young, Secretary).
13–14—Maranoa P., A., and I. Association, Mitchell (W. J. Rogencamp, Secretary).
13–14—Fassifern A. and P. Association, Boonah (G. E. Ball, Secretary).
13–14—Murgon P., A., and H. Society (N. Waldock, Secretary).
20–21—Western P. and A. Association, Roma (F. W. Mills, Secretary).
20–22—Queensland P. and A. Society, Ipswich (H. W. Watson, Secretary).
26–27—Wallumbilla A. and P. Association (M. J. Grace, Secretary).
27–28—Esk P., A., and I. Association (T. C. Pryde, Secretary).

June 2–3 —Marburg and District A. and I. Association (G. E. Dance, Secretary).
3 —Brookfield, Pullen Vale, and Moggill Farmers' Association (John Phillips, Secretary).
3–4 —Logan and Albert A. and P. Society, Beaudesert (P. F. Dever, Secretary).
19–20—Lowood and Tarampa P. and A. Association (S. Coleman, Secretary).
23–27—Rockhampton Agricultaral Society (H. Hill, Secretary).

July 1–2 —Lockyer A. and I. Society, Gatton (Percy Skinner, Secretary).
2–3 —Biggenden A. and P. Society (C. J. Stephensen, Secretary).
3–4 —Sandgate A., H. and I. Association (W. F. Kenny, Secretary).
24–25—Rosewood A. and H. Association (R. J. Walsh, Secretary).
24–25—Ithaca A. and I. Assseiation (T. A. Bennion, Secretary).

Aug. 6 —Humpybong A., H. and I. Society, Redcliffe (C. G. Graves, Secretary).
10–15—Royal National A. and I. Association of Queensland, Brisbane (J. Bain, Secretary).
26–27—Crow's Nest A., H. and I. Society (J. Pike, Secretary).

Sept. 24–25—A. and P. Society of Southern Queensland, Beenleigh (W. Laughlin, Secretary).
26—Rocklea A. and I. Society (C. R. Gwynne, Secretary).
26—Maroochydore Agricultural Society.

Oct. 1 —Kenilworth P., A., H. and I. Society (R. Houston, Secretary).
2–3 —Toombul A., H. and I. Association (A. J. Thompson, Secretary).
9 —Southport A., H. and I. Society (S. H. Earl, Secretary).
10—Enoggera A., H. and I. Association (N. Thomson, Secretary).

BARLEY, OATS, RYE, AND WHEAT FOR SEED PURPOSES.

By F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch, Department of Agriculture and Stock.

The Regulations under the Pure Seeds Acts prescribe the maximum amount of foreign ingredients that may be contained in sowing seeds.

In the case of seed barley, oats, rye, and wheat, the term "Foreign ingredients" includes:—

Inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; dead, diseased, insect infested, and non-germinable seeds.

The term "Inert matter" means:—

Chaff, dust, stones, broken seeds, and any matter other than seeds.

The standards prescribed by the Regulations are:—

SCHEDULE A.

FOREIGN INGREDIENTS.

Kind of Seed.	Inert Matter.	Seeds of weeds or seeds of any cultivated plant not included in Schedule A which will not pass through a metal sieve perforated with round holes 2 mm. in diameter.	Seeds of weeds which will pass through a metal sieve perforated with round holes 2 mm. in diameter.	Seeds of any cultivated plant included under Schedule A other than seeds of the kind to which the sample purports to belong.	Seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn apple), *Ricinus communis* (Castor oil plant), and diseased or insect-infested seeds.	Dead and non-germinable seeds.
	Per cent.	Per cent.		Per cent.		Per cent.
Barley (*Hordeum spp.*) ..	2	1	Nil	2	Nil	15
Oats cultivated (*Avena spp.*)	2	1	Nil	2	Nil	20
Rye (*Secale cereale*)	2	1	Nil	2	Nil	20
Wheat (*Triticum spp.*) ..	2	1	Nil	2	Nil	15

From Schedule A it will be noted that seed barley, oats, rye, and wheat should not contain more than 2 per cent. of inert matter, 1 per cent. of weed seeds, 2 per cent. of any cereal grain other than that to which the sample purports to belong; and in the case of oats not more than 20 per cent. of dead and non-germinable

seeds. As an example we will assume a farmer has 100 lb. of seed oats. The maximum amount of foreign ingredients allowed is as follows:—

Inert matter	2 lb. =	2 per cent.
Seeds of weeds, or of any cultivated plant, other than barley, wheat, rye, that will not pass through a sieve perforated with round holes 2 mm. in diameter (about 1/12 of an inch)	1 lb. =	1 per cent.
Seeds of weeds that can be taken out of the bulk by the sieve referred to	None	
Seeds of barley, wheat, and rye	2 lb. =	2 per cent.
	5 lb. =	5 per cent.
Oats, not less than	95 lb. =	95 per cent.
	100 lb.	

It will therefore be noted that the maximum amount of foreign ingredients (other than dead and non-germinable seeds) that may be contained in 100 lb. of seed barley, oats, rye, and wheat is 5 lb.; and in no instance should the amount exceed that set out for each particular foreign ingredient.

In the example given it is assumed that the purity of the oats is 95 per cent. As the amount of dead and non-germinable seeds allowed in oats is 20 per cent., it follows that a sample with a germination of 80 per cent. and a purity of 95 per cent. would give the farmer 76 lb. of germinable oats in the 100 lb. referred to. This figure is sometimes called real value and can be ascertained by multiplying the analytical purity by the germination and dividing by 100.

A sample of wheat recently examined was found to be free from weed seeds, or seeds of oats, barley, and rye, yet it contained 14 per cent. of broken wheat; the purity was therefore only 86 per cent. The pure seeds had a germination of 85 per cent. A farmer sowing such a sample would put in 73 lb. of germinable wheat to every 100 lb. sown. It is therefore obvious that the percentage of analytical purity is an important factor to every farmer sowing such cereals as are covered by Schedule A of the Regulations.

Another important point is "Germination." This can best be ascertained by testing at temperatures similar to those existing in Southern Queensland during the month of May.

It cannot be too widely known that no charge will be made to farmers sending samples to the Seed Laboratory, Brisbane, for examination, provided each such sample has enclosed therewith the particulars as set out in the following form:—

SAMPLES OF SEED OATS, BARLEY, RYE, AND WHEAT

Will be examined for Farmers Free of Charge provided this form is filled in and enclosed with sample.

Sample representing—

bags of

Grown by

or

Purchased from

Sender's name

Full postal address

Date of sampling

Important.—All samples must be drawn from grain in the farmer's actual possession, care being taken to ensure each sample being truly representative of the bulk, and of not less weight than half a pound.

Samples to be forwarded to—

THE OFFICER IN CHARGE,

Seed Laboratory,

Department of Agriculture and Stock, Brisbane.

Copies of the form, for enclosure with each sample, may be obtained from the Department of Agriculture and Stock, Brisbane, or from Officers of the Department in the various country districts.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the next few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bag or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

Orchard Notes for March.

THE COASTAL DISTRICTS.

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become overdeveloped before it is packed, otherwise it may arrive at its destination in an overripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits, does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which has again proved its superiority in the recent shipments of oranges from the

Southern States to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach-moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The latter varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit is being given in the Granite Belt area during the present season by Mr. Rowlands, the Fruit Packing Expert, whose practical advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening state, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1924 AND 1923, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1924.	Dec., 1923.
North Coast.	In.		In.	In.
Atherton	7·52	23	11·48	6·51
Cairns	8·97	42	15·48	7·18
Cardwell	8·45	52	7·36	7·51
Cooktown	6·87	48	18·03	1·98
Herberton	5·64	37	3·66	4·46
Ingham	7·16	32	6·73	7·12
Innisfail	12·08	43	14·19	13·39
Mossman	12·24	15	17.51	6 86
Townsville	5·48	53	8·33	2·04
Central Coast.				
Ayr	3·89	37	4·51	3·07
Bowen	4·46	53	2·99	3 21
Charters Towers ..	3·60	42	2·94	2·65
Mackay	6·79	53	6·96	2·86
Proserpine	8·61	21	5·93	4·16
St. Lawrence ...	4·59	53	2·46	2·75
South Coast.				
Biggenden	4·47	25	4·49	5·13
Bundaberg	4·71	41	3·62	3·78
Brisbane	4·89	73	1·56	2·92
Childers	5·51	29	4·42	8·13
Crohamhurst ...	6·83	30	4·20	9·09
Esk	4·45	37	2·39	6·30
Gayndah	4·01	53	5·60	8·03
Gympie	5·73	54	3 95	5·19
Caboolture	...	...	3·18	5·14
Kilkivan	4·35	45	5·12	7·85
Maryborough ...	4·70	53	4·47	5·59

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec, 1924	Dec, 1923.
South Coast—continued:	In.		In.	In
Nambour	6 24	28	6·74	5·75
Nanango	3 80	42	2·44	6·06
Rockhampton ...	4·58	37	7 57	3·41
Woodford	5·47	37	2·70	7·58
Darling Downs.				
Dalby	3·16	54	3·23	7·92
Emu Vale	3·62	28	3·01	3 99
Jimbour	3·15	36	2·85	3·87
Miles	2·71	39	5·61	7·35
Stanthorpe ...	3 52	51	2·32	2·91
Toowoomba ...	4·24	52	5·52	7·36
Warwick	3 51	59	2·34	3·55
Maranoa.				
Roma	2·43	50	2·10	3·68
State Farms, &c.				
Bungeworgorai ...	2 92	10	1.54	1·94
Gatton College ...	3·45	25	1·94	3·88
Gindie	2·73	25	3·73	4·28
Hermitage ...	3 09	18	2·53	3·40
Kairi	6·58	10	9·51	2·34
Sugar Experiment Station, Mackay	7·94	27	6·17	3·16
Warren	3·48	10	3·56	1·38

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for last December, and for the same period of 1923, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	JANUARY.		FEBRUARY.		JAN.	FEB.
					MOONRISE.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	p.m.
1	5·1	6·49	5 26	6·46	11·17	12·33
2	5·2	6·49	5·26	6·45	11·59	1·26
					p.m.	
3	5·3	6·49	5·27	6·45	12·55	2·17
4	5·3	6·50	5·28	6·44	1·47	3 9
5	5·4	6·50	5·28	6·44	2·41	4 0
6	5·5	6·50	5·29	6·43	3·31	4·48
7	5·6	6·51	5·30	6·42	4·22	5·36
8	5·6	6·51	5·31	6·42	5·12	6·16
9	5·7	6·51	5 31	6·41	6 3	6 54
10	5·8	6·51	5·32	6 40	6 51	7·35
11	5·9	6·51	5·33	6·40	7 35	8 11
12	5·9	6·51	5 34	6·39	8·18	8 47
13	5·10	6·51	5 34	6·38	8 57	9·27
14	5·11	6 51	5 35	6·37	9·33	10 4
15	5 12	6 51	5 36	6·37	10·10	10 44
16	5·13	6·51	5·36	6 36	10·47	11·29
17	5·13	6·51	5 37	6·35	11·23	...
						a.m.
18	5·14	6 51	5·38	6·34	...	12·11
					a.m.	
19	5·15	6 51	5·38	6 34	12·4	1·11
20	5·16	6·50	5·39	6·33	12·46	2·11
21	5·16	6 50	5·40	6·32	1·34	3·15
22	5·17	6 50	5·40	6·31	2 26	4 21
23	5·18	6·49	5·41	6 30	3·33	5·25
24	5·19	6·49	5 42	6·29	4·29	6 28
25	5 19	6 49	5 42	6·28	5·34	7·29
26	5·20	6 48	5·43	6·27	6·42	8·28
27	5·21	6·48	5·44	6 26	7·46	9 27
28	5·22	6 48	5 44	6 25	8·48	10·22
29	5 23	6 47	...	...	9 48	...
30	5·24	6 47	...	...	10·44	...
31	5·25	6·47	...	...	11·38	...

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Phases of the Moon, Occulations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

2 Jan.	(	First Quarter	9 25 a.m.
10 ,,	○	Full Moon	12 47 p.m.
18 ,,	)	Last Quarter	9 33 a.m.
25 ,,	●	New Moon	12 45 a.m.

Apogee, 8th January, 6 30 p.m.
Perigree, 23rd January, 11 30 p.m.

There will be a total eclipse of the sun, occurring on the other side of the world, about midnight of the 24th. It will be visible on a narrow track in Canada and across the Atlantic to the northward of Scotland. Other phenomena will be invisible in Australia. Mercury will be at its greatest elongation west of the sun on the 20th and, therefore, visible before sunrise during the latter part of the month. Venus, Jupiter, and Mercury will be in remarkably close conjunction before sunrise on the 22nd. Mercury, the smallest, will be to the west of Jupiter, and Venus, the most brilliant, to the east.

1 Feb.	(	First Quarter	2 43 a.m.
9 ,,	○	Full Moon	7 49 a.m.
16 ,,	)	Last Quarter	7 41 p.m.
23 ,,	●	New Moon	12 12 p.m.

Apogee, 5th February, 5 6 a.m.
Perigee, 21st February, 5 0 a.m.

Venus and Mercury will be apparently close to one another in the early mornings of 3rd and 4th February. A partial eclipse of the moon will occur on 9th February, soon after the moon has set in Queensland. Saturn being in quadrature with the sun on 3rd February will rise about midnight. Two other eclipses will occur this year, one of the sun in July, and one of the moon in August. Both of these will be visible to some extent in Queensland.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIII. MARCH 10, 1925. PART 3.

Event and Comment.

The Current Issue.

A timely note on the necessity of improving the supply of cotton seed is contributed by Mr. Evans. Fruit fly investigations in the Stanthorpe area are further described by Mr. Hubert Jarvis, while Mr. Pollock discusses Tomato Wilt and varieties of the tomato plant resistant to that disease. Wheat variety and fertiliser trials in the Warwick district are described by Mr. Clydesdale and Mr. Smith. Mr. Shelton's subject this month is paralysis of the hindquarter in pigs. Mr. White has an interesting note on Bassia Birchii, commonly called "Chinese burr," in this month's instalment of his series on the weeds of Queensland; and, with Mr. Francis, he also supplies a further note on Queensland trees. A reprint of an important paper on phosphorus in the live stock industry from the "Journal of the Department of Agriculture," Union of South Africa, will greatly interest stockowners. The writers, Sir Arnold Theiler, Dr. H. H. Green, and Dr. P. J. du Toit, offer proof that Lamsiekte, which closely resembles the disease known to us as impaction paralysis, is indirectly due to phosphorus deficiency. They, however, conclude that the direct cause is a "ptomaine poisoning" brought about by infection of carcass débris, and express an opinion that when a normal supply of phosphorus in soil or vegetation is available cattle do not exhibit a depraved appetite and decaying carcasses are left untouched. Science notes and entomological hints useful to canegrowers are supplied by Mr. Edmund Jarvis, and, generally, the March Journal will be accepted as a very useful number.

Ministerial Changes.

One of the most important events of the month was the elevation of the Minister for Agriculture and Stock, Mr. W. N. Gillies, to the Premiership of Queensland, in consequence of the resignation of that office by Mr. E. G. Theodore as a preliminary to his entrance into the wider Federal sphere. In addition to the Premiership, Mr. Gillies has taken over the portfolios of Chief Secretary and

Treasurer of the State. Mr. W. Forgan Smith, who has held the office of Minister for Works and State Enterprises for over five years, and who has often acted as Minister for Agriculture and Stock, has succeeded Mr. Gillies in that office. The new Premier has the distinction of being the first farmer to occupy the position of first citizen of Queensland, while Mr. Forgan Smith brings to his new office a wide knowledge of the agricultural industry and its economic problems. Character sketches of both Ministers will be featured in the April Journal.

Wheat Growers' Tribute to the Premier.

At the last meeting of the Queensland State Wheat Board a resolution of hearty congratulation to Mr. Gillies on his appointment as Premier of Queensland was unanimously carried. Members of the board expressed the opinion that during his term of office as Minister for Agriculture Mr. Gillies had always shown marked sympathy with the primary producers of the State in all their problems and perplexities, and had been of immense assistance to the Wheat Board and agriculturists generally.

Crossbred Wheats for Disposal.

Graded wheats bred at the Roma State Farm, tested last season on the Downs, and which are described in this issue, are listed for disposal at the Department of Agriculture and Stock. They are recommended to wheat men as suitable for cultivation in the Queensland wheat belt. The wheats offered include "Three Seas," a prolific bearded variety of quick maturing qualities and strongly resistant to rust; "Cedric," a non-bearded type rather slower in growth than "Three Seas," but of good stooling and rust-resistant properties, and with a slightly reddish chaff; "Roma Red,$_2$" a white chaffed, non-bearded, with a reddish grain; "Amby," a well-known variety and a fairly consistent yielder in the Maranoa and on the Downs; "Flower," a selection from a cross between "Bobs" and "Florence," non-bearded, white chaffed, and of quick-maturing habit; and "Novo," a wheat that has proved highly successful in the Inglewood and Maranoa districts. These wheats are available at 9s. per bushel, freight paid from Brisbane to any siding within the recognised wheat region. Applications for supplies, accompanied by remittance (and exchange), should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Late Mr. William Rowlands.

The announcement of the tragic death of Mr. William Rowlands, Fruit Packing and Marketing Officer, of this Department, and formerly Fruit Packing Instructor for Tasmania, was received with widespread expressions of deep regret. On 19th February Mr. Rowlands passed away suddenly in the street in Stanthorpe at the early age of 35 years. Mr. Rowlands was well known among fruitgrowers of Australia and New Zealand, and his name was rapidly becoming a household word in the orchard areas of this State. Born in Tasmania he crossed to New Zealand when quite a youth for the purpose of taking charge of a number of apple-packing sheds. In every office he held, either in the Commonwealth or the Dominion, he did excellent work for the fruit industry. Returning to Tasmania under Government engagement, he revolutionised the fruit-packing methods in that State, and did wonderfully good work generally, a work highly appreciated by Tasmanian orchardists. In 1922 Mr. Rowlands's services were secured for Queensland by Mr. Gillies, but prior to that he had been loaned to this State for a term by the Tasmanian Government. In Queensland he did particularly good work in improving the packing of bananas, pineapples, citrus fruits, tomatoes, and apples, and in this connection the fruitgrowers of Queensland owe a great deal to a man who was not only a highly efficient specialist, but an esteemed friend. Mr. Rowlands probably had few equals in the art of preparing fruit for market, and his death is a severe loss to the Australian fruit industry. As a citizen Mr. Rowlands was what Australians call a white man. Not only did he serve his country well in the civil sphere, but also on the battlefield. An original Anzac, he fought with the New Zealand Light Horse on Gallipoli. At the evacuation he was dangerously wounded in the region of the heart. After twenty months in hospital, he was able to return to Australia, but this wound eventually caused his death. Mr. Rowlands was, before the war, a member of one of the famous "All Black" Rugby football teams, with which he represented the Dominion. There is no doubt that Mr. Rowlands spent himself in the service of his chosen industry and his hard work for the fruitgrowers imposed too great a strain on a war-injured heart. By the school children of the fruit districts he will be especially missed, for his fruit-packing classes were a very bright feature of their lives. Glowing tributes to his worth and work were paid by Mr. Gillies, his fellow officers, and the metropolitan, country, and periodical Press.

THE IMPROVEMENT OF THE COTTON SEED SUPPLY.

G. EVANS, C.I.E., M.A., Director of Cotton Culture.

The cotton seed that up to the present has been available for planting in Queensland is of very mixed origin, and it is now generally realised that one of the most urgently required measures in order to place this new industry on a more satisfactory footing is the substitution for this seed by a pure variety suited to the country.

The mixed character of the existing seed is obvious to the veriest novice. A cursory examination of a handful of seed discloses the fact that it consists of units varying greatly in size, shape, and colour. Some of the seeds are large, others small, some are covered with fuzz, others are smooth or naked. The fuzz itself varies in colour, a large number of seeds having a dense green fuzz, whilst in others the colouring is grey, brown, or white.

In the field this unevenness is just as marked and it does not require a trained observer to note that the plants grown from this seed vary greatly among themselves. The individual plants may be tall and bushy or dwarf and with comparatively short branches. The capacity for fruiting varies from plant to plant, some setting far more bolls than others. Similarly, there is great variation in the size and shape of the bolls, the time of ripening and other factors, which must render it obvious to the farmer that he would certainly obtain very much more satisfactory results if he could obtain more uniform seed.

The lint characters also show great differences, and the cotton from individual plants adjacent to each other in the field show marked differences in the length of staple, in the texture of the fibre, and the "body" of the cotton itself. These factors have been noticed from time to time by the spinners using Queensland cotton, who have remarked in particular on the irregularity of our staple.

When the origin of this mixed seed is gone into one cannot wonder at this criticism, because the records indicate that the seed is derived from many different varieties. For instance, in 1904 it is on record that the Department of Agriculture imported 2 tons 16 cwt. of the following varieties of cotton seed:—

Sea Island varieties: Rivers, Seabrook.

Egyptian varieties: Mit Afifi, Ashmouni.

Upland American varieties: Russell's Big Boll, Peterken, Truitts, Culpeper, Jones's Improved, and Southern Hope.

This seed was distributed to farmers and in the succeeding years became hopelessly mixed, both during ginning operations and through cross pollination in the field. The existing seed is the result of this mixture with the addition of one or two varieties that have been imported in small quantities from time to time since.

The urgent need for introducing better seed was recognised by the Queensland Department of Agriculture at the commencement of the present revival of cotton growing. It was realised, however, that the greatest precautions would have to be taken to prevent the introduction of exotic pests and diseases with the seed, and it was therefore decided that it would only be possible to import small quantities of seed at a time and that this would have to be fumigated before entry and grown under quarantine conditions for the first year. The best advice was sought by the departmental officials with regard to suitable varieties, and in 1920 it was decided to import a small quantity of the Durango variety from the States. This variety is of Mexican origin, where it was cultivated under dry land conditions, in a climate not unlike that of Queensland. It had been carefully bred up by the Agricultural authorities in the States, and tests had proved conclusively that it yielded well under varying conditions and over a wide range and was hardy. In the first season in Queensland the seed was grown in quarantine. During the next season the seed from this plot was planted by selected farmers on isolated blocks distributed through the cotton belt, from Roma and Capella in the west to coastal districts on the east, and from the Lockyer in the south to Mareeba in the north. The produce from each of these plots was picked and ginned separately and a definite opinion was obtained from the best authorities in England of the value of the lint produced under these varying conditions. The results were satisfactory in that although the length of staple produced under dry conditions out West only averaged about 1⅛ in. as against 1¼ in. to 1 $\frac{5}{16}$ in. from some of the coastal plots, yet the produce from individual plots was regular, and regularity in length of staple is one of the most

important factors demanded by the spinners. This system was extended in 1923-24 and further test plots were arranged all over the cotton belt, and in addition several pure seed areas consisting of groups of farmers who promised only to grow Durango, were planted. Last year some 200 bales were produced from these areas, but the results of the spinning tests have not yet been received, although the brokers' valuations have been highly satisfactory.

In the present season, planting on the community system has been extended, and there are some 6,000 acres under this variety. The officers of the Cotton Section have visited every Durango grower, and each plot has been marked with regard to its degree of isolation from other varieties and to the fact that it has been planted on clean land and not on land that was under mixed cotton in the previous season. These areas receive special tags which the farmers attach to their consignments of seed cotton before despatch to the ginnery. Special arrangements have bene made with the British Australian Cotton Association to ensure that the seed is also kept pure during ginning operations. All the Durango cotton for this season will be treated at Gladstone Ginnery only, and particular arrangements have been made to see that the specially tagged lots are kept pure and apart from the rest.

As the present season has up to date been favourable, and the Durango plots are, according to inspectors' reports, likely to yield heavily, it is anticipated that there will be sufficient Durango seed to more than plant the whole of Queensland next year. Queensland growers will, therefore, be in a position to substitute their existing unsatisfactory mixed seed for a pure long-stapled variety which has been tested all over the State and acclimatised in the country during the last four years. As regards the quality of this variety, there is no question. Durango will give an average length of staple of 1 $\frac{3}{16}$ in., and cotton of this length is in very great demand at the present time, as there is a chronic shortage of stample American cottons.

The present premiums for cotton of this class and staple length are from 400 to 450 points on, and this should do a great deal to assist growers to meet the lower market prices that now prevail.

The first step, therefore, is to get the whole cotton belt under this pure variety. This, of course, is not finality, as the Department recognises that it is possible that even better results may be obtained in some parts of the cotton belt with other varieties, and that it should also be possible to select special strains out of Durango itself to suit certain conditions and localities.

Selection work on a systematic scale is proceeding steadily on the Durango variety on the State Cotton Farm at Monal and Callide, but seed of these improved strains of Durango will naturally not be available for distribution on a large scale for some time.

With regard to other new cottons, a good deal of time and attention is being directed to the study of promising varieties on specially selected plots. The behaviour of these new varieties under our local conditions is being carefully observed, and detailed records of the time of growing, shedding number of bolls, &c., are being made. At the same time, selection work is being carried out with a view to isolating types of these new cottons that appear to suit Queensland conditions. Special attention is being paid to drought resistance, earliness, hardiness, and size of the bolls, in addition to the lint characters.

The Acala variety, which is rapidly becoming famous throughout the States, is being specially studied on the College Farm at Gatton, where special arrangements have been made with the authorities of the Agricultural College and High School. Lone Star, a well known Texas variety, and Webber 49, are similarly being studied, and other varieties that are being grown under observation by the Department are Lightning Express and Delta type Webber.

All this work takes time, but it is hoped in a few years that the Department will be in a position to offer to any particular community seed specially adapted to meet their local conditions. In the meantime, until these new types are available, it is obvious that the cotton grower cannot do better than to plant the selected and acclimatised Durango seed that will be available for distribution in the autumn of 1925. As the same time, there is ample scope for the development of some organisation that will encourage the growing of "community" cotton, and so prevent the degeneration of the seed that occurred on the previous occasion through the indiscriminate mixing of varieties.

FRUIT FLY INVESTIGATION.

Report covering work carried out and observations made by the Entomologist stationed at Stanthorpe, Mr. Hubert Jarvis, during the months of November and December, 1924.

A.—FRUIT FLY.

Overwintering Field Experiments.

In pursuance of an experimental inquiry, cages containing maggot-infested fruit, and placed on the soil in the orchards last autumn, have from time to time during the months of November and December, 1924, been examined for fruit fly emergence.

No fruit flies have, however, been found in these cages, nor were any fruit fly puparia met with on sieving the soil under them. This is in keeping with what might occur did the fruit fly not overwinter in the soil, in the Stanthorpe area.

Seasonal Occurrence and Fruit Attack Incidence.

During November the fruit fly was generally active in many orchards, more particularly at the north-west end of the Granite Belt area, ovipositing in hard immature fruit and leaving (unaccountably) maturing fruit (such as apricots and early peaches) "unstung."

The following fruits seemed to particularly attract "the fly" this season:—Apples: Lady Carrington, Twenty Ounce, Majory Hay, and Sharp's Early. Plums: Shiro and Santa Rosa. Nectarines: Goldmine. All these fruits were "stung" when quite hard and immature.

Snyd peaches (the earliest local variety) were almost, if not quite, free from fruit fly attack; yet at the same time on the next tree, or row, immature apples, &c., were badly stung.

If, as is generally assumed, the aroma from ripening fruit is attractive to "the fly," it is to be inferred that ripening apricots and peaches would be visited by the fly sooner than immature plums and apples. This, however, apparently was not the case this season, a fact difficult to account for.

On 15th November, Inspector E. Stephens found fruit fly maggots in hard immature plums, variety "Santa Rosa." The insects in this case had, even then, penetrated to the centre of the fruit; and subsequently mature fruit flies were bred from the maggots in this fruit.

On 24th November, Inspector T. E. Smith discovered fruit fly maggots in "Goldmine" nectarines. The nectarines at this time were not more than 1 in. in diameter, yet the maggots were nearly full grown—quickly pupating, and giving rise to fruit flies on 15th December.

The two foregoing instances point to the importance of cleaning up (early in the season), from under the trees, and forthwith destroying, *all* immature fruit, however small.

Danger of Importation in Citrus Fruit.

During November, a quantity of citrus fruit fly maggot-infested fruit (lemons) from Cherry Gully (Warwick District), was imported into this district and discovered and destroyed by the Chief Inspector, Mr. T. Lowry. Several of the maggots from this citrus fruit, retained by this office and placed in the insectary, subsequently gave rise to fruit flies (*C. tryoni*).

Danger of Importation of Cucurbit and Tomato Fly *(D. cucumis).*

On 24th November several fruit flies were submitted to me for identification by Inspector C. F. Williams, Warwick. These flies Mr. Williams had bred from "Papaws" (Papayas) received from beyond his district. They were subsequently identified by Mr. Tryon, Entomologist and Pathologist, as *Dacus cucumis* Frogt, senr., a fruit fly fairly common on the east coast from Buderim northwards. *Dacus cucumis* is a cucumber and melon fruit fly and has not yet been bred from deciduous fruits.

Checks on Immigration a Comparative Failure. First Brood Fruit Flies.

During the month of December most orchards shares a comparative immunity from fruit fly attack. Probably the fly appearing in the district as it did—early in October—in large numbers, and then ovipositing in hard and immature fruit, helped to improve the situation, as a fairly large percentage of eggs deposited in this fruit failed to hatch. Others hatched and failed to develop into flies. The cold and continued flood rains experienced in November and December may have acted as a check to further fruit fly immigration, apparently indicated by the earlier manifestation. It cannot be affirmed, however, that meteorological conditions experienced, and facts regarding fruit fly occurrence, this season, will hold good again next year.

Influence of Tree Shade on Fruit Fly Occurrence.

It has been noticed that orchards in sheltered situations are generally more subject to fruit fly visitation than those orchards in an exposed position. This is in accordance with the shelter-loving habits of the Queensland fruit fly. It, in fact, generally chooses the largest and most shady trees in an orchard in which to remain settled, irrespective of the fact of such trees carrying a crop of fruit or not.

(*Note.*—Trapping should be more successful in these fruitless shelter trees, and is so, than in more open trees carrying ripening or ripe fruit.)

Incidence of Prevalence in Successive Years.

In some cases orchards comparatively free from fruit fly attack last season were badly attacked this spring. Again, orchards where little or no fly was present last season are again enjoying this freedom from fly this season.

The theory, held by some, that an orchard which has been infested with fruit fly one season will be regularly infested each succeeding year does not receive support from occurrences relating to fruit fly occurrences during this and the previous fruiting period. Many orchards in which the fly was abundant last autumn have been this season almost quite free from the presence of "the fly." The comparative freedom from fruit fly presence this year, from December to date, has been shared by all or almost all orchards in this district.

One or two growers whose fruit was much injured by fly attack last season have this season lost scarcely a fruit. At the same time they have not used poison-sprays, lures, or repellants.

This absence, or partial absence, of fruit fly is apparently due largely to meteological factors of a special character.

Special Control Measures Ineffective.

Various so-called control measures have been tried this year, such as trapping by means of a lure, repellents, poison-bait, sprays, &c.

As regards so-called repellents, many orchardists using them have had little or no fly; but this immunity has been shared, too, by those not using repellents.

The same may be said of trapping with lures. I have stated in previous reports that we have no proof at all that setting traps baited with a lure in an orchard will keep the fruit free from fruit fly attack. Experiments this season again confirm the truth of the above statement, as far as it is concerned.

It is, of course, possible that an efficient lure may yet be made, and experiments along these lines should be continued. The same also applies to repellents or deterrents, and to poison sprays.

Orchard Hygiene or "Picking Up" Helpful.

The only really helpful method of controlling the Queensland fruit fly (*C. tryoni*) in this district is that of a prompt systematic gathering and destruction of all fallen fruit, and all maggot-infested fruit—both that on the ground and that on the trees. Boiling is the only method of destroying the maggots in infested fruit, authoritatively recognised this year.

This "picking up" and destruction of infested fruit, first recommended in relation to the Queensland fruit fly by Mr. H. Tryon (Queensland Government

Entomologist) in 1887, thirty-eight years ago, on his discovery of the fruit fly which bears his name, and since then insisted on by all who have been engaged in fruit fly control-work, is undoubtedly of the greatest use in reducing the spread and breeding of this notorious insect.

When we consider that as many as forty fruit fly maggots have been found in one peach, and that these forty maggots can, in two generations, produce as many as 2,000 female fruit flies, the importance of cleaning up cannot be too much stressed.

The systematic inspection of all orchards directed by the Chief Inspector, Mr. T. Lowry, and the supervision of the destruction of all infested fruit, has this season largely prevented any great number of fruit flies being bred within the district, than has been remarked.

Fruit Flies in Native Fruits.

The danger of native fruits, as furnishing a suitable medium for the propagation of incalculable numbers of fruit fly (*C. tryoni*), is a very real one. Recent reports from various parts of Queensland confirm this. The native host-fruit of certain species of fruit flies, visiting this district annually, have been recently discovered, and the flies bred and identified from these fruits.

Fruit Fly in Mulberry.

Horticultural Instructor W. Leslie, Toowoomba, found fruit fly maggots in the fruit of the mulberry in Toowoomba on 20th November, and reported the fact to this office. Although mulberries are grown in the Stanthorpe District, they have not yet been found to harbour fruit fly maggots.

(*Note.*—Breeding experiments have shown these maggots are those of *D. tryoni*.—H.T.)

B.—USEFUL INSECTS.—INTRODUCTION.

The Woolly Aphis Parasite *(Aphelinus mali).*

(*Note.*—The successful establishment of the insect is narrated in H. Jarvis's September-October report.—H. T.)

The breeding and distribution of the Woolly Aphis parasite has occupied a good deal of time. During the months of November and December over 2,000 parasites were liberated. The following is a list of the centres receiving some:—Stanthorpe, Applethorpe, The Summit, Thulimba, Cottonvale, Dalveen, Severnlea, Glen Aplin, Fletcher's Siding, Ballandean, Wallangarra, Fleurbaix, Sugarloaf, and Glen Niven. *Aphelinus mali* is now established in the following centres:—Severnlea, Dalveen, Ballandean, The Summit, and Stanthorpe.

The work (in "cleaning up" the Woolly Aphis) being done by this little parasite is most encouraging; several orchardists report its spreading rapidly from the nursery tree where first liberated to adjacent Woolly Aphis infested trees. Applications for the Woolly Aphis parasite are almost daily being received and it is at present difficult to meet all demands.

An effort will be made next season to place this valuable parasite of the Woolly Aphis in every orchard throughout the district, and in a few years time a marked improvement in the control of this pest should be noticeable.

An effort, too, might be made to extend the usefulness of the Aphelinus to other parts of the State. It is claimed that it will attack any dark-coloured aphis. If this be the case, there is abundant work before it, in both the citrus and banana districts.

Fungus Disease.

The climatic conditions this season have been particularly favourable to the development of numerous fungus and pathological troubles. A large number of examples manifesting diseases of this nature have been forwarded to the Queensland Government Pathologist, Mr. H. Tryon, and his valuable reports on same have been duly received and appreciated, both by individual growers concerned and myself.

The interest taken, by all the inspectors, in the identification of the various fungus troubles affecting deciduous fruit trees and vegetables, as the outcome of this and other procedure of the kind, is very gratifying; and I am indebted to all of them for securing specimens of interest for submission to the head office, where necessary.

TOMATO WILT AND RESISTANT VARIETIES.

N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

A disease of the tomato plant, now popularly termed "Tomato Wilt," though that name has been given to certain other diseases to which the tomato plant is subject and which show their effect in a wilting of the foliage, first appeared to a damaging extent in the Bowen district some seven years ago, and has since been responsible for a considerable diminuation of the crop in the southern districts of the State. At Bowen during the seasons of 1919 and 1920 the disease was very prevalent and was there investigated by the writer, whose observations and deductions were published in the "Queensland Agricultural Journal" (July, 1922, volume 18, p. 10).

Symptoms of the Disease.

The first indication of attack is usually noted by a bright yellowing of one or more of the bottom leaves of the plant, followed by a wilting of one or more branches or the whole plant, which may die off quickly or linger on for several weeks according to the severity of the attack. If the stem of the affected branch it cut through or if a slice is made along the stem, lifting the bark and a little of the sapwood, a brownish discoloration will be noticed in the vascular tissue (sapwood). This discoloration shows the fungus causing the trouble which has been identified by the Vegetable Pathologist as a species of the genus *Fusarium*.

The fungus is parasitic and originates in the root or gains entry at a damaged portion of a root, from which it spreads upwards into the stem and branches rather than towards the ends of the roots, breaking down the cell walls and filling them with the mycelium of the fungus, thus obstructing the flow of sap, causing a wilting of the foliage and ultimate death of the part attacked. If an affected branch of the plant is taken and a thin layer of the bark and sapwood is removed from the tip to the root serving that branch, it will be noticed that the first portion towards the end of the branch shows the pale green colour of healthy tissue, while on proceeding down the discoloration due to the mycelium of the fungus will be noticed, becoming darker as it becomes older, to a part of the root where it first originated (frequently showing earlier damage), when it becomes lighter in colour again towards the end of the root, which, like the end of the branch, may show healthy tissue.

Where the plant with a main or tap-root is affected the whole plant will wilt and soon die, but where there are several main roots one only may become affected, when a wilting will occur on a branch supplied by that root, while the rest of the plant will appear healthy until the fungus spreads to the other roots or stems.

How Infection Occurs.

Though there was nothing to be seen on the fruit of affected plants to indicate disease, it must have been originally brought into the State with imported seed and distributed by this means, since the appearance of the disease in isolated situations can only be accounted for in that way.

Where the disease has made its appearance in a field it can be safely surmised that the soil of that field will become infected and that the spores of the fungus can be carried from one field to another by cultivating implements, wind, or other agencies.

Age of Plants when Affection is Noted.

This varies a great deal. The disease sometimes shows its effect shortly after the plants are set out and from then on until after the first picking of fruit. I have no recorded instance of the disease appearing in the seed bed up to the time of planting out, and it is not usual to find the disease in plants, though neglected, left in the seed bed.

While it is probable that plants may be affected in the seed bed and show no apparent sign, it is held that infection also occurs in the field when known healthy plants are set out, which tends to the belief that entry is gained through a part of a root damaged when transplanting or in after cultivation.

In the course of the seasons of 1921 and 1922 many experiments were conducted by the Department in respect to efforts to control as well as in the raising of disease-resistant varieties.

Experiments in control lay in sterilising the seed bed, seed treatment and after treatment of the plant, while treated seed was sown in permanent locations in the field for comparison with plants from the same seed when transplanted. Some slight encouragement was given in the results of some of the experiments, as treated plants were later in developing the disease than untreated, while the plants from seed sown in the permanent location showed much less disease than those transplanted as well as much heavier crops.

It was realised, however, that any treatment of the plants in rendering them immune must be such as to entail very little trouble or expenditure of time on the part of the grower to allow of its being adopted, so further experimenting in this direction was discontinued and attention concentrated on the propagation of disease-resistant varieties, in which a very great measure of success has been obtained.

Disease Resistance.

It was noted when investigating the incidence of disease that all early-maturing varieties, such as "Chalk's Early Jewel," "Earliana," and "Matchless," were very susceptible to *Fusarium*, while later maturing sorts were more resistant, showing attack much later in their growth. Attention was accordingly given to the search for the most resistant variety, amongst the Bowen crops, that would yield an acceptable quality and quantity of fruit. On Mr. Walter Hurst's farm a strain of the "Buckeye" variety was noted, which showed vigorous growth and total absence of disease while producing large quantities of fruit satisfactory in size and shipping quality. Seed from these plants was secured for departmental trials and the attention of farmers drawn to the variety as offering the best resistance to disease yet noted.

The variety was then called "Hurst's Buckeye," but later when it was noticed that Hurst and Co., seedsmen, of London, listed a variety under that name it was altered to "Bowen Buckeye."

Following the result of a trial overseas of fifty-five varieties in disease resistance, seed of four varieties with acceptable quality of fruit, while showing the best resistance to disease, was imported by the Department and tried out in competition with the "Bowen Buckeye" on several farms in the Bowen district. On only one farm did any of the plants become affected and then only to a slight extent, whilst on four other farms none of the varieties showed any symptoms of disease, though in two instances where a susceptible variety was planted as a check every plant of that variety showed disease and died before any fruit had ripened.

The imported varieties were "Norton," "Norduke," "Columbia," and "Marvel." With the exception of "Marvel," which variety produced fruit too small for market, the first three mentioned varieties have been grown together with the "Bowen Buckeye" each year by Mr. J. T. Moore, Bowen, in collaboration with the Department, with a view to keeping the varieties pure and to improve them by careful seed selection. Two varieties have been selected from sports in these trials and named "Denisonia" (after Port Denison) and "Roselawn Buckeye" (after "Roselawn," the name of Mr. Moore's farm), both of which appear to be coming true to type and can be recommended for trial.

There are consequently six varieties that have proved themselves disease resistant, while at the same time providing fruit of excellent quality. Mr. J. T. Moore's farm is recommended as a source of supply by the Department, and he can supply each variety in 1s. packets, or 5s. per oz. The varieties are described as follows:—

"Bowen Buckeye."

This variety is a very vigorous grower, somewhat straggly in habit and covering a lot of ground; it is the prime favourite of the Bowen growers to the extent of over 90 per cent. of the crop grown. In the Northern Division it has proved itself over all varieties as the heaviest cropper in all districts from Bowen to Burketown and seems well suited to warm conditions. The fruit is of good size and shape, ripens to a pinkish colour, and is very free from blemish. It would be improved in solidity, in which it is inferior to the other varieties described. Grown in the comparatively dry climate of Bowen it stands shipment very well, but possibly would not do so well if grown under humid conditions.

"Roselawn Buckeye."

A sport from "Bowen Buckeye," which it greatly resembles in growth and on which it is an improvement in size and solidity of fruit.

"Norton."

A very vigorous grower with thick foliage, more compact and upright in growth than the "Bowen Buckeye." Crops well, though later than the last named, produces fruit of excellent even size and shape, with good flavour, which ripens to a rich red colour; is solid fleshed with a good skin, and proves a good carrier. Probably the best fruit of all the varieties.

"Norduke."

A cross between "Norton" and "Duke of York." A vigorous grower forming a large bush and crops well; fruit is solid, of good flavour, carries a good skin, ripens to a good colour, and is of excellent quality for shipping. Occasional fruits show a tendency to flatten.

"Columbia."

A similar bush to "Norton." Crops well, giving fruit that is solid fleshed and large, though with a tendency to flatness; carries well. During a wet season or under frequent showers this variety can be calculated to crop very well.

"Denisonia."

A sport from the "Marvel" variety over which it shows marked superiority. Grows a very bushy plant, which is very hardy; is a heavy cropper, giving deep and solid fruits which carry excellently.

The following statistics of the output of tomatoes from the Bowen district will show the effect of the growth of the "Wilt" resistant varieties from the season 1921 onwards. Cases are half bushels.

1919—Disease prevalent	94,350 cases.
1920—Disease prevalent	99,698 cases.
1921—With disease resistant varieties ..	137,372 cases.
1922—With disease resistant varieties ..	166,166 cases.
1923—A droughty season	51,524 cases.
1924—A good season	266,631 cases.

While the varieties that do well in the North may not do so well in the South it may be expected that some of the varieties described will come up to expectations. Growers are advised to confine their attention to proved resistant varieties, and to carefully select seed from the best plants which produce the largest quantity of fruit of the required size and shape, as well as other desirable qualifications. Carelessness in seed selection means speedy deterioration in quantity and quality of fruit, while careful selection can be expected to maintain quality and yield if not to improve it.

Rotation of Crops.

The growth of tomatoes season after season in the same soil without intervening crops is to invite disease, which more readily attacks individual plants in which the vitality is lowered, and to increase the infection of the soil with the spores of the disease. The judicious use of fertilisers (see Fertiliser Trials, "Q.A.J.," December, 1924) and rotation of crops, with an occasional ploughing under of a suitable green crop to keep up the supply of organic matter, will not only tend to keep down infection but can be calculated to allow of much heavier crops being obtained.

Electrified Seed.

It is claimed by some people that the electrification of seed renders the resultant plants immune to the attack of "Wilt." This has not been proved, for though plants from electrified seed may not have been attacked, it is possible that the seed was from a resistant variety. When seed of a susceptible variety such as "Chalks' Early Jewel" is treated by the electric process, and plants therefrom grown on infected soil without disease, while plants from the same lot of seed not treated develop the disease, then some justification may be made for the claim. At present the claim is viewed as having no foundation in fact, and probably is as groundless as the claim put forward some years ago that crops grown from electrified seed would yield much more heavily than crops from similar seed not treated.

WHEAT VARIETY AND FERTILISER TRIALS.

That the systematic and thorough cultivation will give greater returns than those obtained from lightly cultivated and fertilised land, is amply demonstrated in the following account of wheat and fertiliser trials carried out by the department on the farm of Mr. E. M. Larsen, at Campbell's Plains, on the Warwick-Maryvale Line.

Mr. Larsen wrote to the Department of Agriculture and Stock on 11th February, 1924, and in part of his letter said: "For a few years after my ground was cleared and broken up it yielded record crops but for several years past I have been unable to grow even a fair crop regardless of good rainfall and cultivation, so I have come to the conclusion that my soil is deficient in some particular plant food." Mr. Larsen further stated that he "had tried superphosphates for wheat," applying up to 1 cwt. per acre, following it up next year with another ½ cwt. but the crop did not show up to any better advantage. Mr. Larsen asked for advice and stated that he would like the department to carry out an analysis of the soil. Subsequent to the analysis being made which showed that phosphoric acid, nitrogen, potash, and lime were present and available in sufficient quantities for the requirements of an ordinary crop, arrangements were made respecting fertiliser and variety tests on the 19½ acres, and the work connected therewith was carried out by two officers of the Field Branch—Assistant Agricultural Instructor Mr. C. S. Clydesdale and Field Assistant Mr. S. Smith.

Fertiliser Tests.

Variety of wheat used "Three Seas" (CCC3) produced at Roma State Farm by crossing "Comeback" and "Cretan" wheats crossed again with "Cretan." The seed was treated with Copper Carbonate for Bunt and Smut prevention at the rate of 1 oz. per bushel and drilled in 10th May, 1924, on well-prepared land at the rate of 45 lb. per acre.

Plots each one-sixth of an acre were laid out and fertilised as follows:—

No. 1.—Control (unmanured).
No. 2.—Superphosphate, 1 cwt. per acre.
No. 3.—Nauru phosphate, 1 cwt. per acre.
No. 4.—Nauru phosphate and superphosphate, 1 cwt. per acre.
No. 5.—Complete manure, 1½ cwt. per acre.
No. 6.—Complete manure, 3 cwt. per acre.
No. 7.—Control (unmanured).
No. 8.—Superphosphate, 1 cwt. per acre.
No. 9.—Nauru phosphate, 1 cwt. per acre.
No. 10.—Nauru phosphate and superphosphate, 1 cwt. per acre.
No. 11.—Complete manure, 1½ cwt. per acre.
No. 12.—Complete manure, 3 cwt. per acre.
No. 13.—Control (unmanured).

The complete fertiliser was composed of—

113 lb. Superphosphate, 68 lb. Sulphate of Ammonia, 113 lb. Naura phosphate, and 27 lb. Sulphate of Potash.

The harvesting of these plots took place on 13th and 14th November, the results being as follows:—

No. 1.—30 bushels 24 lb.
No. 2.—29 bushels 30 lb.
No. 3.—28 bushels 12 lb.
No. 4.—27 bushels 36 lb.
No. 5.—25 bushels 48 lb.
No. 6.—30 bushels 18 lb.
No. 7.—27 bushels.
No. 8.—26 bushels 4 lb.
No. 9.—24 bushels 54 lb.
No. 10.—27 bushels 36 lb.
No. 11.—26 bushels 26 lb.
No. 12.—27 bushels 54 lb.
No. 13.—27 bushels 24 lb.

From the above it will be seen that the highest yield was obtained from the unmanured plot No. 1, whilst Nos. 5, 6, and 2 were next in order, clearly demonstrating in this particular instance that, given a proper system of early and thorough cultivation and a sufficiency of moisture, that no need exists as yet for fertilisers on this particular piece of country.

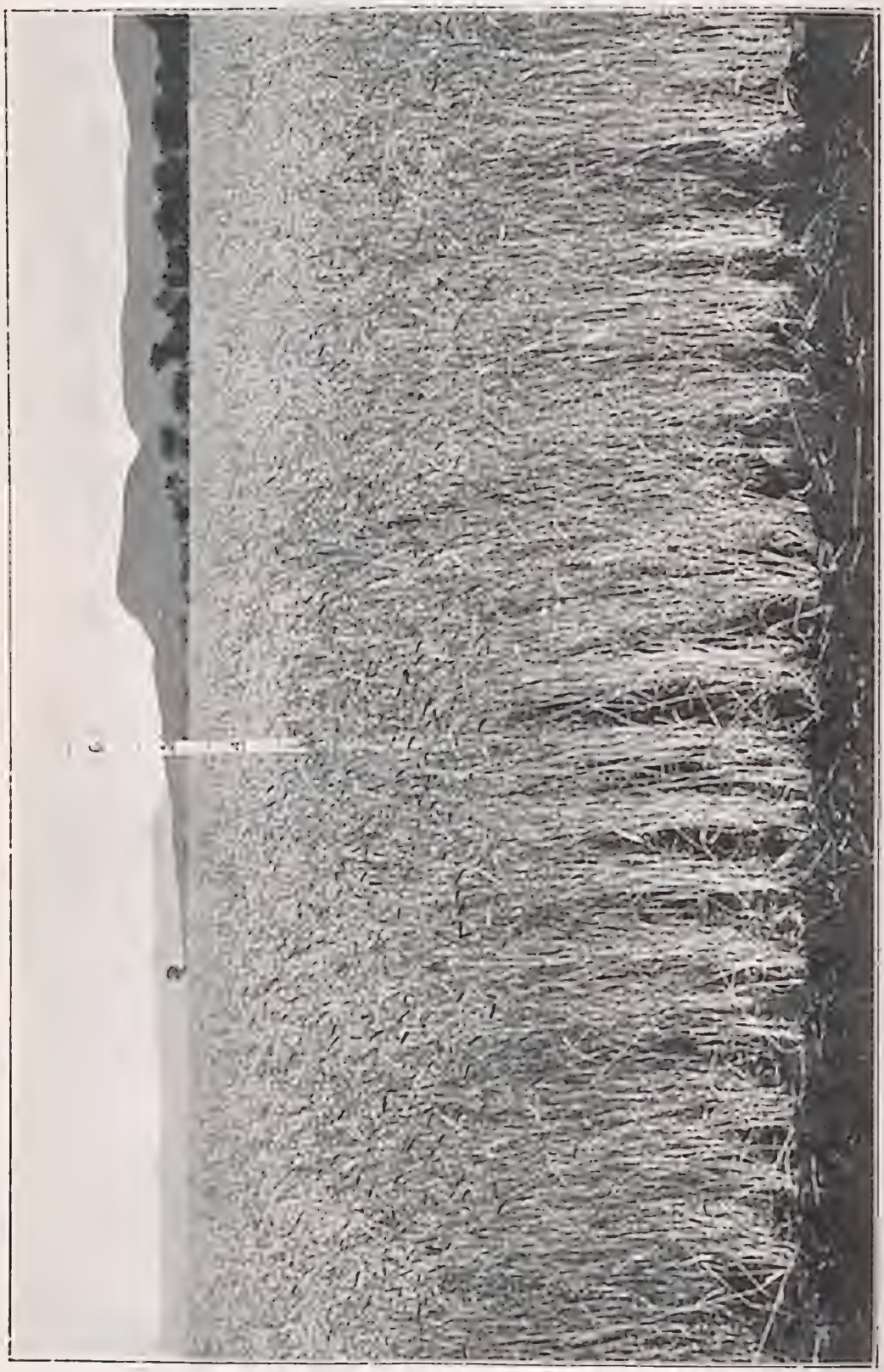

PLATE 37.—VARIETY TESTS AT MR. E. M. LARSEN'S, CAMPBELL'S PLAIN.

Plate 38.—Variety Tests at Mr. E. M. Larsen's, Campbell's Plains, Amby.—Yield, $28\frac{21}{60}$ bushels per acre.

Variety Tests.

Varieties used.—Cedric, Roma Red$_2$, Amby, "Flower," "Three Seas," and Novo. Dates of sowing 12th, 13th, 14th May, 1924. Rate of seeding ¾ bushel per acre drilled in—seed previously treated with carbonate of copper at the rate of 1 oz. per bushel, as a Bunt preventive; the resultant crops were Bunt free.

A comparative test was made with six different wheats representing promising departmental varieties for the purpose of determining their value under local conditions. No fertilisers were used other than those applied for observation and comparative purposes in the form of a complete manure to strips of crop the width of a seed drill running through the centre of each plot. The fertiliser was of a similar composition to that used in the fertiliser tests and applied with the seed at the rate of 1½ cwt. per acre, but proved to have no influence whatsoever on plant development or on the resultant yield.

Progress reports were from time to time submitted and are summarised as follows:—

5th June: Very little rain experienced since planting—viz., 15 points on 15th May and 44 points on 2nd June. Plenty of soil moisture present, due to good cultivation. Seed germinated well and coming along nicely. No oats or foreign growths present. Frost has been severe since wheats sown—up to the present no difference was to be observed in any of the plots.

10th July: 159 points of rain recorded—wheat doing very well. Heavy frost experienced on the 2nd July, which cut the wheat very badly. No perceptible difference in any of the fertiliser plots, or where a complete fertiliser was used in the variety tests.

29th August: A month's dry weather experienced since 10th July. Heavy frosts on the 5th (11 deg.) caused considerable damage to the wheat plots generally. No noticeable difference in the fertiliser plots. Reported 123 points over a space of three days with prospects of continuance.

30th September—Rainfall for the month, 347 points.
31st October—Seven wet days for a total of 253 points.
November: Rainfall to date of harvesting, 180 points.

Harvesting was completed by 18th November, 1924, a reaper thresher drawn by a McCormack-Deering motor being used for the work.

The yields obtained were—
3 acres Cedric, 29 bushels per acre.
3 acres Amby, 28 21/60 bushels per acre.
3 acres Roma Red$_2$, 24 34/60 bushels per acre.
3 acres "Flower," 16 34/60 bushels per acre.
3 acres Novo, 24 28/60 bushels per acre.
3 acres "Three Seas," 10 55/60 bushels per acre.

Summary.

"Three Seas" (a bearded variety) proved to be a quick grower, a light stooler with bright yellow willowy straw, strongly resistant to rust. Frost affected the crop at one end of the paddock, and accordingly reduced the aggregate yield.

Cedric is a non-bearded variety having a reddish chaff, somewhat slower in growth than CCC3, but a good stooler; straw is bright yellow. This variety was also slightly affected by frost, but shows strong rust-resistant qualities and furnished the highest yield.

Roma Red$_2$, also non-bearded, having a white chaff but red grain. This variety is fairly rust-resistant, and carries a pale yellow straw; a good stooler, but suffered from frost, which affected the yield.

Amby, a well-known white chaffed and non-bearded variety, proved strongly frost-resistant; stooled well, and although showing slight traces of rust, gave a satisfactory yield throughout.

"Flower" is a non-bearded white chaffed wheat of poor stooling, but quick-maturing habits. Badly cut by frost and showed slight traces of rust. These influences combined acted detrimentally on the yield.

Novo.—This is a slower maturing wheat than the previous variety, and has given good results in the Inglewood and Maranoa districts. A yellow-strawed non-bearded variety, and a good stooling wheat; was badly frosted and showed very slight traces of rust.

It was shown as a result of the test that by the employment of improved departmental varieties, enhanced returns were secured, the average yield from the plots showing an increase of ten bushels per acre over that obtained on the farm on which the trials were carried out.

Graded seed of the above varieties is available for sale on application to the Department in Brisbane.

Plate 39.—Variety Tests at Mr. E. M. Larsen's, Campbell's Plains.
Roma Red$_2$—Yield, 24$\frac{34}{60}$ bushels per acre.

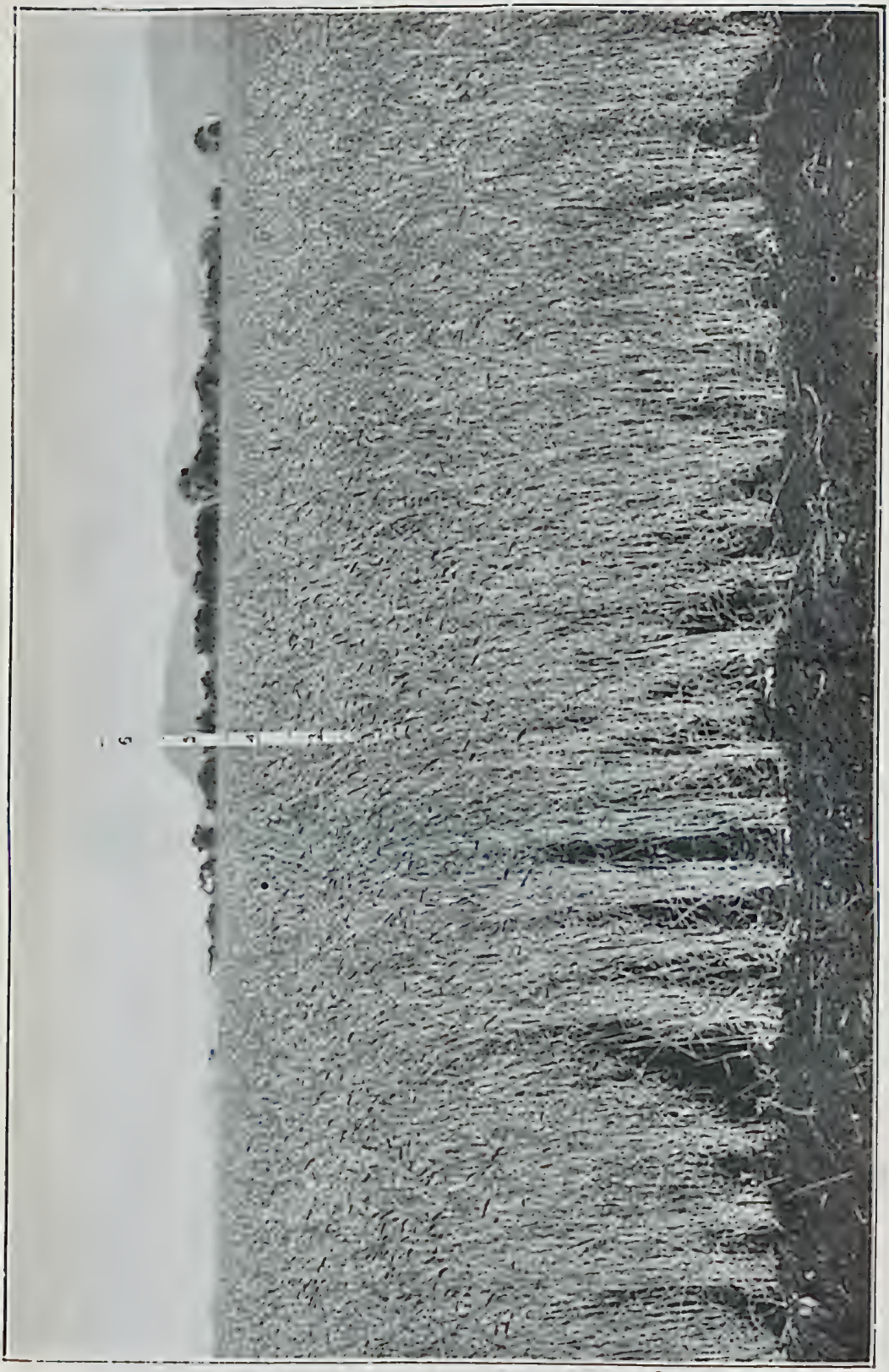

PLATE 40.—VARIETY TESTS AT MR. E. M. LARSEN'S, CAMPBELL'S PLAINS.
NOTE.—Yield, 24½ bushels per acre.

PARALYSIS OF THE HINDQUARTER IN PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Prominent amongst the diseases to which pigs are subject in Queensland, we find the trouble most frequently referred to as Paralysis of the Hindquarter occupying a place. This disease is, unfortunately, not confined only to young pigs, nor is it localised in Queensland. It appears to be a source of considerable trouble wherever pigs are kept the world over. In an interesting communication received recently by the writer from Professor L. A. Maynard, of the New York State College of Agriculture, Department of Animal Husbandry, he has this to say with regard to this trouble:—

"This problem has been under investigation here for several years, and a bulletin dealing with the subject will be published shortly, a copy of which will be sent to you.

"On the basis of our studies, we believe the trouble is the result of improper mineral nutrition which prohibits a normal development of bone. This is due to a lack of calcium in most of our rations. We have shown that where paralysis occur, the long bones are very deficient in calcium and phosphorous, and marked histological changes have occurred. These changes have been observed on a diet low in calcium. However, a lack of calcium is not the only factor involved, because the question of assimilation also comes in.

"Certain feeds are rich in the factor aiding mineral assimilation, and certain others are not. A ration which contains a certain amount of chopped alfalfa (green lucerne or lucerne chaff) is very useful for preventing paralysis, because it supplies the needed calcium and phosphorous and the factor aiding assimilating as well. We have shown, however, that there is a very beneficial effect from the adding of ground limestone and bone meal to rations which are now causing the trouble."

In a communication from Professor R. Adams-Dutcher, Head of the Department of Chemical Agriculture at the State College and Experiment Station, Pennsylvania, U.S.A., the following remarks appear:—

"I have the feeling from the knowledge that I have been able to obtain by reading, and in experimenting, that the diet is a very important factor in preventing paralysis in pigs, and probably calcium and phosphorous accompanied by proper vitamin-carrying foods are the most important dietary factors. Any number of animals have been relieved of the paralytic symptoms by feeding bone meals or other mineral mixtures carrying calcium and phosphorous; mixtures which carry calcium carbonate have also been effective. Veterinarians in New York have had fairly good success with wood ashes, but it is my recommendation that lime or bone meal be made available in those districts where hog paralysis is causing trouble. If lucerne or some other leafy greenstuff or hay is available, this would also improve the situation, helping the animals to utilise this mineral matter to the best degree of efficiency."

The following extracts have been taken at random from mimeographs supplied quite recently by Professor John M. Evvard, as a result of extensive experiment along the lines of feeding mineral mixtures, both simple and complex, to pigs not only with the idea of preventing paralysis, but of stimulating growth and enhancing the returns.

Comment.

(1) The feeding of minerals in whatever form allowed was quite advantageous, in that the average daily gains were substantially increased, the length of the feeding period economically shortened, the feed required per 100 lb. gain considerably reduced, and the profits per pig enhanced.

(2) In feeding experiments the appetites of pigs for minerals is shown to be of considerable reliability, inasmuch as they clearly excelled check groups receiving no minerals.

(3) Although there appears to be some advantages gained from the feeding of a mineral mixture carrying more than the single emphasised ingredients, such as common salt, calcium carbonate, bone ingredients, and potassium iodide, yet just how far one can afford to go in the adding of other ingredients in practice is a matter for individual estimation and determination. Our experience has certainly indicated that some of the main ingredients necessary in the mineral mixtures are those that carry sodium, chlorine (common salt), calcium (lime, limestone, and bone materials), phosphorous (bone materials, rock, and other phosphates), and iodine

PLATE 41.

Symptoms of Paralysis of the Hindquarter, also sometimes known as breaking down in the back.

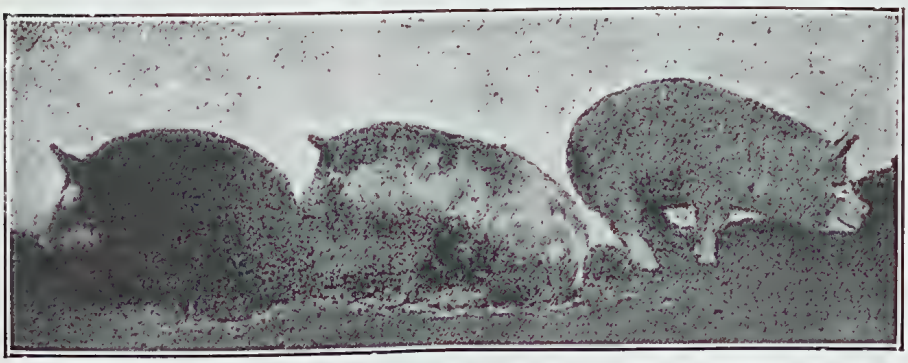

PLATE 42.

These pigs are suffering from a very severe attack of Paralysis of the Hindquarter. The pig on the right is still able to move about, but is in an advanced stage of the disease.

Picture is of pigs fed on a ration containing a very low mineral content.

Stiffness and partial loss of control followed about six week's feeding.

A second lot, fed the same ration plus five times as much calcium phosphate, **gained 89 per cent. more weight.**

Both lots were slaughtered.

The skeleton of the pigs in the lot (*see* picture) weighed 1,193 grams. That of the other lot fed the minerals weighed 2,371 grams, or **100 per cent. more.**

(potassium or sodium iodide). The further addition of suitable combinations of such ingredients as common sulphur, a little charcoal, some glauber's salts, as well as some other ingredients in small percentages or quantities has, on the whole, shown some benefits in our experimental work.

(4) It appears as if the farmer in his feeding of sulphur, charcoal, and other often-questioned materials has not gone entirely wrong, and like his well-founded belief in yellow corn (as against white corn), we should be sure of our ground before declaring them or any of them non-beneficial.

(5) Our other work with minerals has shown the dollar and cents practicability of adding a good mixture of mineral ingredients to many ordinary pig rations.

(6) Our general recommendation is to provide a suitable mineral mixture for all classes and grades of pigs, the growing pigs, the breeding sow, the suckling pigs, the boars and all, and it is our suggestion that the mineral mixture be self-fed in an easily accessible place, well protected, and under shelter if possible.

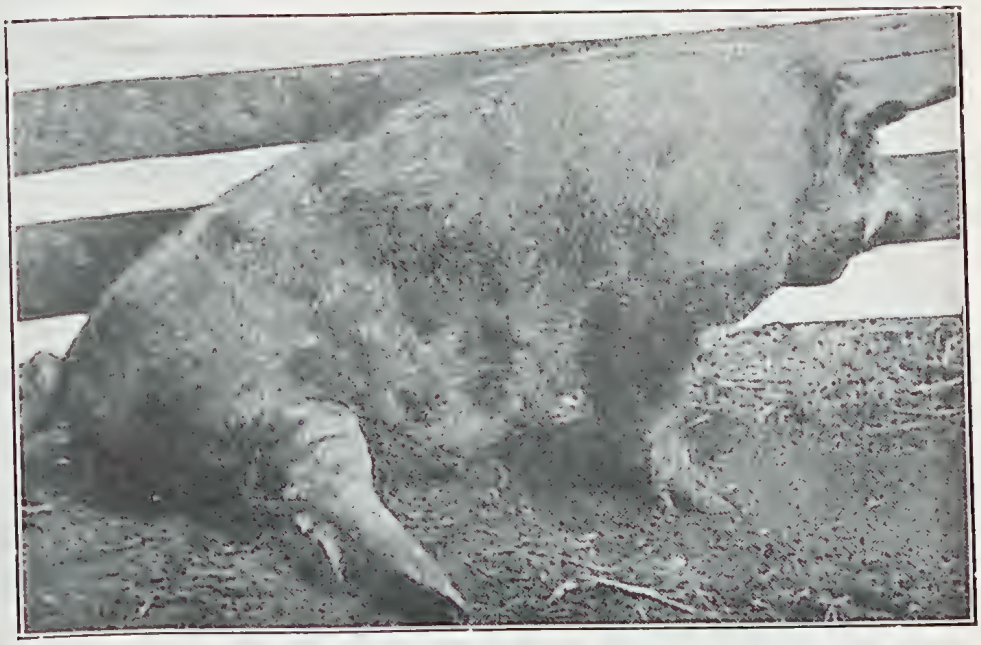

Plate 43.—A Typical Case of Paralysis of the Hindquarter.

It will be noted that although suffering from this disease, the animal still carries a good deal of condition. His appetite is not usually affected to any great extent.

(7) A good mineral mixture may be made up for practical every-day feeding as follows:

Common salt	20 per cent.
Finely ground raw bone meal, or steamed bone meal, or spent bone, black or rock phosphate, or acid phosphate ..	40 per cent.
Finely ground high calcium, limestone, or wood ashes, or finely ground oyster shell, or lime thoroughly air slacked ..	40 per cent.
Total	100 per cent.

If sulphur is desired, add approximately 10 lb. to the 100 lb. To every 100 lb. of the above minerals, add from ½ to 1 oz. of potassium iodide, mixing all ingredients thoroughly.

WEEDS OF QUEENSLAND.

No. 38.

By C. T. WHITE, F.L.S., Government Botanist.

BASSIA BIRCHII (A "Chinese Burr").

Description.—A spreading, intricately-branched, somewhat woody plant of about 2 to 3 ft. high. Stems and leaves clothed with a white cottony wool, more or less disappearing from the older parts. Leaves small and mostly under ½-in. long and about two lines broad. The "burrs" (botanically fruiting perianths) are exceedingly numerous, one being borne practically in the axil of each leaf; they are densely clothed with cotton wool, and are armed with fine unequal spines, the longest spine on the older burrs, and usually about ½-in. long, occasionally longer.

Distribution.—A native of Western Queensland and New South Wales.

Common Names.—Most commonly known in Western Queensland as "Chinese Burr." The plant, however, is a native, not an introduction from Asia, and this vernacular more particularly belongs to an Asiatic plant naturalised in North Queensland—viz., *Triumpetta rhomboidea*.. The plant is rather brittle, and large pieces or whole plants break off, get blown along by the wind, picking up other plants as they move along, forming a big, rounded mass, until the bundle is stopped by some obstacle, such as a fence post or tree. It hence shares with other plants the name of "Roley Poley," though it is by no means the species most commonly known by that vernacular. It is a "Bindii" ("Bindy-eye"), a name now applied to a number of different burr plants in Western Queensland.

Properties.—Outside its noxious character as a bad burr plant, the weed is not known to contain any harmful properties. Of recent years it has spread very much in Western Queensland and New South Wales, particularly along stock routes, and has made its appearance as far eastwards as the Lockyer district. It is often sent to this Department as a noxious weed. Its spread in grazing country is due to its not being eaten by stock, and to its drought-resistant qualities; being a drought-resister and easily attached to the wool and the hair of animals, it is easily carried by stock from one district to another.

Botanical Name.—*Bassia Birchii* F. v. M. First Census Australian Plants, 1882; *Anisacantha Birchii*, F. v. M. Fragmenta Phytographiæ Australiæ VIII. 163.

Notes on the Genus Bassia.—The genus Bassia contains about fifty species found in Southern Europe, Northern Asia, and temperate Asia, but finding its greatest development in the drier parts of Australia. The genus was founded by the Italian botanist, Allioni, in 1766, on *B. muricata*, a Southern European species. In the "Flora Australiensis," the genus is divided into three smaller ones—viz., *Chenolea*, *Anisacantha*, and *Sclerolæna*. These are separated by only small differences, and none have priority over *Bassia* as a name, and the lastnamed genus is now generally accepted by all botanists.

In 1771 the German botanist Koenig established a genus called "Bassia" on an East Indian tree, and in many works Koenig's genus stands for a number of tropical trees of the family *Sapotaceæ*. Most modern writers, however, now generally accept Allioni's genus as having priority, and the Sapotaceous one was changed by Baron Mueller to Illipe, which name is now generally held.

PLATE 44.—BASSIA BIRCHII—THE SO-CALLED "CHINESE BURR" OF WESTERN QUEENSLAND.

Details :—4, Anthers; 5, Pollen Grain; 6, A "burr"; 7, A "burr" in longitudinal section; 8, Fruit; 9, Seed; 10, Seed, 1 in. (all enlarged, but to various extent) longitudinal section. (Taken from an illustration, Baron Ferdinand von Müeller's Iconography of Australian Salsolaceous Plants).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1925 AND 1924, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1925.	Jan., 1924.		Jan.,	No. of Years' Records.	Jan., 1925.	Jan., 1924.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	11·81	23	10·54	5·76	Nambour	9·15	28	15·36	5·06
Cairns	16·38	42	10·21	7·90	Nanango	4·49	42	6·78	4·45
Cardwell	16·70	52	13·09	4·85	Rockhampton ...	8·89	37	7·62	1·22
Cooktown	14·85	48	4·86	6·43	Woodford	7·28	37	10·01	5·03
Herberton	9·55	37	9·10	6·38					
Ingham	15·99	32	14·48	7·39					
Innisfail	20·39	43	12·75	8·97					
Mossman	17·70	15	18·03	4·85	*Darling Downs.*				
Townsville	11·46	53	10·95	1·55					
					Dalby	3·32	54	5·83	2·64
					Emu Vale	3·06	28	5·33	5·15
Central Coast.					Jimbour	3·64	36	7·92	2·08
					Miles	3·81	39	3·84	2·85
Ayr	11·77	37	7·81	1·93	Stanthorpe ...	3·49	51	6·69	6·91
Bowen	10·20	53	6·08	0·65	Toowoomba ...	4·86	52	6·43	4·77
Charters Towers ..	5·79	42	9·55	0·30	Warwick	3·47	59	6·17	6·40
Mackay	15·01	53	6·93	1·35					
Proserpine	16·89	21	9·79	3·93					
St. Lawrence ...	9·97	53	5·70	2·12	*Maranoa.*				
South Coast.					Roma	3·38	50	2·25	2·51
Biggenden	5·41	25	8·00	2·05					
Bundaberg	9·14	41	13·66	1·48	*State Farms, &c.*				
Brisbane	6·33	74	7·49	2·27					
Childers	7·76	29	10·78	2·81	Bungeworgorai ...	2·24	10	2.11	2·61
Crohamhurst ...	12·56	30	11·86	7·13	Gatton College ...	4·13	25	4·18	2·38
Esk	5·44	37	8·54	3·92	Gindie	3·92	25	7·60	0·14
Gayndah	4·75	53	5·83	0·49	Hermitage ...	2·84	18	5·21	5·86
Gympie	6·71	54	11·80	2·07	Kairi	7·48	10	8·30	3·75
Caboolture	7·50	37	9·12	4·60	Sugar Experiment Station, Mackay	16·07	27	...	1·82
Kilkivan	5·62	45	5·65	1·38	Warren	6·12	10	2·14	2·20
Maryborough ...	7·38	53	13·79	2·44					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

QUEENSLAND TREES.

BY C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

The Deep Yellow-wood (*Rhodosphæra rhodanthema*) is a fairly well-known tree, as its bright yellow wood is so conspicuous. The bark is very scaly, and is shed in oblong or sometimes nearly square flakes. In this respect the bark is somewhat like that of Red Cedar, and because of this resemblance the Deep Yellow-wood is sometimes popularly called Yellow Cedar. The trees are often found on the banks of streams in the heavy rain forests of the coast, and in these places they do not exceed about 60 ft. in height and 1 ft. in stem diameter; they have short stems and spreading crowns. In the rain forest of drier areas the trees are larger, attaining about 80 ft. in height, and a barrel diameter of about 1 ft. 6 in., and the dwarf-spreading habit characteristic of more humid areas is less in evidence. When the bark is bruised it exudes a gum-like substance. The sapwood is pale and the heartwood a bright yellow. The heartwood should be useful for cabinet work. The trees are found in the rain forests from the Clarence River, in New South Wales, to Maryborough. The round, marble-like fruits are brown and glossy when dry, and are borne in dense bunches at the ends of the branchlets. They are sometimes used for ornamental and decorative purposes.

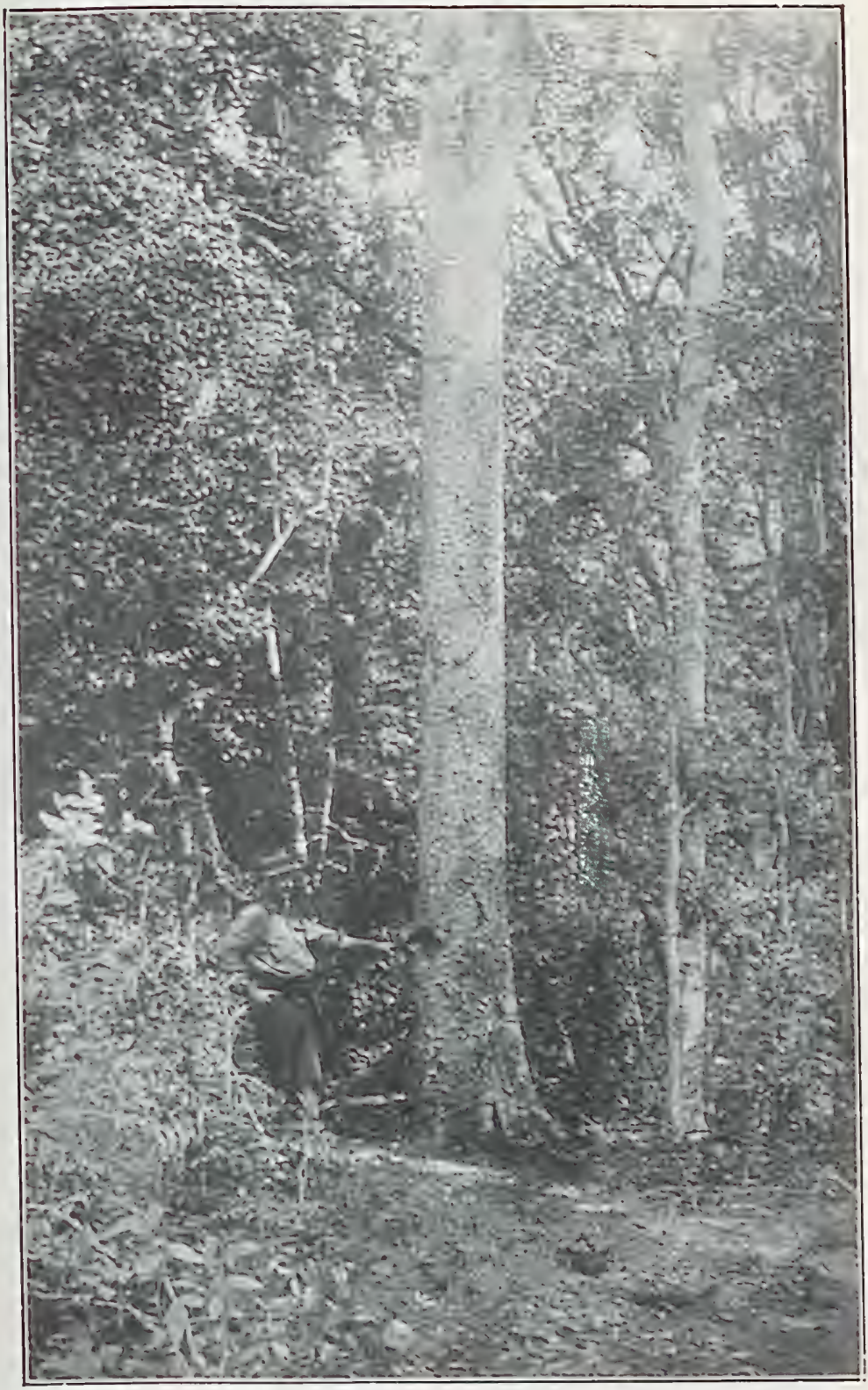

Plate 45.—The Deep Yellow-wood (*Rhodosphaera rhodanthema*).
A tree in the rain forest at Narango.

PLATE 46.—THE DEEP YELLOW-WOOD.
Twigs showing leaves, flowers, and dry fruits.

EGG-LAYING COMPETITIONS.

N.U.P.B.A., ZILLMERE.

2,693 eggs were laid in January, and the average production per bird was: White Leghorns, 17.2; Black Orpingtons, 13.2; and other varieties, 10.2; while for the whole competition the average was 15.3. One death occurred, a Black Orpington owned by Mr. C. E. Raymond. Broodiness was still prevalent among the heavy breeds.

WHITE LEGHORNS.

Pen No.	Owner.	Jan.	Total.
104	Oakleigh P.F. ..	27	261
21	A. Hodge	23	231
82	W. Wakefield ..	26	230
97	K. A. Sommerlad ..	25	229
84	W. Wakefield ..	23	225
88	R. Duff	23	217
95	G. Williams	22	215
89	R. Duff	24	213
12	W. J. Berry	16	212
20	A. Hodge	14	212
105	Oakleigh P.F. ..	19	212
11	W. J. Berry	26	211
92	C. A. Hodgson ..	22	206
90	R. Duff	23	204
79	J. E. G. Purnell ..	20	204
101	A. S. Walters ..	23	203
58	A. Staib	25	199
19	A. Hodge	17	198
73	E. C. Raymond ..	20	196
6	H. T. Pember ..	14	195
41	R. C. Cole	19	194
37	H. Fraser	25	194
25	H. T. Britten ..	21	192
106	W. L. Howard ..	24	191
51	J. Earl	22	190
16	J. T. Webster ..	13	189
1	F. K. Williams ..	21	188
65	E. Tracey	23	188
61	Carinya P.F. ..	22	187
48	R. C. J. Turner ..	24	186
174	S. L. Grenier ..	18	186
80	J. E. G. Purnell ..	24	185
56	J. Hutton	19	184
64	E. Tracey	21	183
13	E. Marks	17	182
74	E. C. Raymond ..	21	181
99	K. A. Sommerlad ..	22	181
39	H. Fraser	21	179
68	Kidd Bros.	20	178
108	W. L. Howard ..	21	178
78	M. F. Newberry ..	17	177
15	G. Marks	15	176
40	R. C. Cole	21	175
87	Enroh Pens	22	175
10	W. J. Berry	19	165
5	H. T. Pember ..	21	164
47	R. C. J. Turner ..	16	164
34	J. L. Chapman ..	24	163
69	Kidd Bros.	21	162
86	Enroh Pens	17	159
100	A. S. Walters ..	11	158
62	Carinya P.F. ..	18	154
38	H. Fraser	10	155
26	H. T. Britten ..	19	151
98	K. A. Sommerlad ..	11	151
59	A. Staib	19	146
76	M. F. Newberry ..	0	146
60	A. Staib	7	142
83	W. Wakefield ..	20	142
172	S. L. Grenier ..	7	142
63	Carinya P.F. ..	16	138
103	Oakleigh P.F. ..	1	131
45	P. F. Adams ..	0	128
46	R. C. H. Turner ..	0	124
91	C. A. Hodgson ..	0	121
93	C. A. Hodgson ..	0	116
50	J. Earl (replaced, 6-10-24)	19	78
30	M. H. Campbell ..	15	B203
14	G. Marks	24	B202
71	J. R. Wilson	21	B195
28	M. H. Campbell ..	19	B194
67	Kidd Bros.	17	B192
52	G. E. Rogers	17	B191
42	R. C. Cole	20	B187
75	E. C. Raymond ..	20	B187
73	W. and G. W. Hindes	20	B164
35	J. L. Chapman ..	0	B161
29	M. H. Campbell ..	2	B161
72	J. R. Wilson	20	B159
49	J. Earl	8	B149
77	M. F. Newberry ..	24	B130
173	S. L. Grenier ..	9	B90
24	A. Neil	0	B86
7	H. Sturman	20	B85
70	J. R. Wilson	25	BE226
66	E. Tracey	25	BE218
102	A. S. Walters ..	24	214
55	J. Hutton	14	BE209
31	W. and G. W. Hindes	23	BE206
54	G. E. Rogers ..	23	203
18	J. T. Webster ..	22	BE202
85	Enroh Pens ..	12	BE193
53	G. E. Rogers ..	18	E193
36	J. L. Chapman ..	22	E189
32	W. and G. W. Hindes	20	BE187
27	H. T. Britten ..	15	E183
8	H. Sturman	23	E176
3	F. J. Williams ..	21	E170
2	F. J. Williams ..	21	E168
9	H. Sturman ..	8	BE167
96	G. Williams	20	BE160
22	A. Neil	15	BE158
23	A. Neil	12	BE157
4	H. T. Pember ..	16	144
57	J. Hutton	8	BE131

* Indicates bird laying underweight eggs.

E Signifies egg under standard weight.

BLACK ORPINGTONS.

Pen No.	Owner.	Jan.	Total.
127	E. Walters	18	227
130	G. E. Rogers ..	19	220
144	F. P. Cummings ..	18	220
156	J. Hutton	15	220
126	T. Brotherton ..	10	215
150	E. C. Raymond ..	18	214
110	T. Fanning ..	24	208
131	G. E. Rogers ..	15	208
143	F. P. Cummings ..	18	208
113	W. R. Wilson ..	16	204
129	E. Walters	17	199
155	J. Hutton	9	198
149	E. C. Raymond ..	23	197
133	C. C. Dennis ..	17	188
111	T. Fanning	0	187
153	Enroh Pens	16	187
116	G. L. Campbell ..	12	185
139	J. Pryde	0	182
125	T. Brotherton ..	16	181
120	H. M. Chaille ..	6	172
145	Everlay P.F. ..	18	172
132	G. E. Rogers ..	19	171
152	Enroh Pens	16	167
134	C. C. Dennis ..	15	163

Pen No.	Owner.	Jan.	Total.
148	E. C. Raymond ..	12	162
128	E. Walters	12	157
137	W. S. Adams ..	16	153
112	W. R. Wilson ..	7	149
121	J. Potter	18	119
124	T. Brotherton (replaced, 30-8-24)	23	118
141	J. Pryde	13	110
118	H. M. Chaille ..	3	85
119	H. M. Chaille ..	20	197
142	F. P. Cummings ..	23	E242
147	Everlay P.F. ..	10	E227
154	J. Hutton	22	E226
114	W. R. Wilson ..	20	E211
138	W. S. Adams ..	14	E199
123	J. Potter	16	E191
140	J. Pryde	12	E186
109	T. Fanning	24	E180
136	W. S. Adams ..	17	E176
115	G. L. Campbell ..	0	E143
117	G. L. Campbell ..	0	BE140
122	J. Potter	0	E131
135	C. C. Dennis ..	13	E131
151	Enroh Pens	1	E126

OTHER VARIETIES.

159	Messines P. F. (R.I.R.)	14	199
169	J. Pryde (Lang.) ..	11	166
157	Messines P. F. (R.I.R.)	15	165
165	A. S. Walters (B.R.)	16	161
167	W. H. Forsyth (S.W.)	16	159
161	T. C. Ollier (B.R.) ..	0	158
168	W. H. Forsyth (S.W.)	1	158
180	J. Ferguson and Son (B.L.)	8	149
158	Messines P. F. (R.I.R.)	17	148
160	T. C. Ollier (B.R.) ..	0	139

178	J. Ferguson and Son (B.L.)	18	138
166	W. H. Forsyth (S.W.)	0	128
164	A. S. Walters (B.R.)	0	109
176	Everlay P.F. (B.L.) ..	7	105
163	A. S. Walters (B.R.)	10	101
170	J. Pryde (Lang.) (replaced, 23-6-24)	18	E138
175	Everlay P.F. (B.L.)	9	E175
162	T. C. Ollier (B.R.) ..	18	E157
179	J. Ferguson and Son (B.L.)	19	E124
171	J. Pryde (Lang.) (replaced, 21-6-24)	13	E121
177	Everlay P.F. (B.L.)	5	E118

B Signifies bird under standard weight.
E Signifies egg under standard weight.

C. KIDD, Hon. Secretary.

N.U.P.B.A., TOOWOOMBA SUB-BRANCH.

Single Test Egg-Laying Competition—Scores to 31st Jan., 1925.

BLACK ORPINGTONS.

Pen No.	Owner.	Jan.	Total.
51	*Holmes, R.	22	230
24	*Carr, T. J.	24	227
41	Wilson, W. R. ..	15	225
42	Wilson, W. R. ..	21	223
15	Macfarlane, K. ..	23	213
23	Carr, T. J.	16	210
45	Stephens, H. B. ..	25	210
30	Adams, W. S. ..	26	209

Pen No.	Owner.	Jan.	Total.
25	Stephens, Moss ..	23	205
9	Everlay P. Farm ..	18	203
10	Everlay P. Farm ..	16	203
39	Rogers, G. E. ..	22	203
32	Radford, G.	21	202
29	*Adams, W. S. ..	10	201
7	*Adams, P. F. ..	21	199
19	Maund, Mrs. L. ..	25	199

* Signifies bird laying under-weight eggs.

BLACK ORPINGTONS—*continued*

Pen No.	Owner.	Dec.	Total.	Pen No.	Owner.	Dec.	Total.
28	Williams, D. W.	18	199	47	*Head, J.	26	160
40	Rogers, G. E.	23	199	8	Adams, P. F.	23	155
50	Ollier, T. C.	18	198	1	Hutton, Jas.	12	154
48	Head, J.	23	195	44	Smith, E. R.	12	154
36	Rivett, R. R.	23	193	37	Short, J. W.	17	152
20	Maund, Mrs. L.	9	192	38	Short, J. W.	21	148
16	*Macfarlane, K.	21	188	33	Potter, Jas.	5	148
6	Walters, E.	16	186	21	Walsh, H.	6	144
22	*Walsh, H.	12	180	18	Champion, S. H. K.	20	134
49	*Ollier, T. C.	26	179	34	*Potter, Jas.	0	132
43	Smith, E. R.	15	178	4	McLay, J. A.	9	129
52	Holmes, R.	8	177	26	Stephens, Moss	5	124
2	Hutton, Jas.	6	176	11	Webb, A. W.	0	122
13	Burns, R.	18	175	31	*Radford, G.	3	99
27	Williams, W. D.	16	170	35	Rivett, R. R.	4	81
3	McLay, J. A.	19	167	17	*Champion, S. H. K.	0	41
14	Burns, R.	19	166	12	Webb, A. W.	0	16
5	Walters, E.	0	160	46	Stephens, H. B.	0	1

OTHER VARIETIES.

70	*Dibbs, H. (Lang.)	27	256	56	*Carr, T. J. (S.W.)	16	164
53	Warrian, C. G. (Rock.)	27	243	69	Dibbs, H. (Lang.)	25	162
66	*Becker, W. (Lang.)	19	208	54	Warrian, C. G. (Rock.)	5	142
60	Le Pla, A. W. (R.I.R.)	10	203	71	Brand, V. (R.I.R.)	6	141
57	*Maund, Mrs. L. (C. W'dotte)	13	190	72	Brand, V. (R.I.R.)	15	128
65	*Becker, W. (Lang.)	5	184	63	Rafter, J. J. (B.L.)	6	117
59	Le Pla, A. W. (R.I.R.)	9	179	58	Maund, Mrs. L. (Col. W'dotte)	8	104
68	*Everlay P.F. (B.L.)	9	176	67	Everlay P.F. (B.L.)	4	104
64	Rafter, J. J. (B.L.)	21	172	55	Carr, T. J. (S.W.)	5	101
61	Harrington, J. (B.L.)	18	167	62	*Harrington, J. (B.L.)	0	42

WHITE LEGHORNS.

132	*Short, J. W.	26	258	78	Howard, R. B.	17	187
112	*Chapman, S.	23	240	80	McBean, S.	25	187
73	Dippel, D. H.	28	238	97	Hunt, G.	22	187
114	Cole, R. C.	24	232	75	Wilson, W.	17	186
131	*Short, J. W.	22	231	99	*Newton, J. W.	20	185
118	Goggins, J.	28	227	120	Rogers, G. E.	22	185
122	Grant, W.	26	227	126	Maurer, G.	25	185
91	Stilton, G.	26	227	106	*Hutton, Jas.	5	183
110	*Enroh Pens	22	224	116	Taylor, Jas.	18	182
121	Grant, W.	25	223	79	*McBean, S.	26	181
123	King, J. E.	22	221	104	*Fallon, P. J.	21	181
105	Hutton, Jas.	16	217	102	Turner, R. C. J.	23	180
113	Cole, R. C.	22	211	107	Adams, P. F.	22	180
124	King, J. E.	24	210	90	Ellis, L. E.	22	179
129	Manning, H. G.	21	209	101	Turner, R. C. J.	3	179
111	Chapman, S.	20	207	74	Dippel, D. H.	9	177
115	Taylor, Jas.	20	207	103	*Fallon, P. J.	17	174
130	*Manning, H. G.	27	204	76	Wilson, W.	16	173
96	Adams, W. S.	25	202	92	Stilton, G.	21	172
100	*Newton, J. W.	23	202	81	Smith, E. R.	22	171
85	Rivett, R. R.	23	201	83	Carinya P. Farm	24	170
88	*Warrian, C. G.	13	200	84	Carinya P. Farm	23	162
125	*Maurer, G.	27	200	77	Howard, R. B.	11	157
93	Williams, D. W.	22	197	89	Ellis, L. E.	17	156
95	Adams, W. S.	19	194	119	Rogers, G. E.	12	154
109	*Enroh Pens	19	194	94	Williams, D. W.	19	152
86	Rivett, R. R.	23	190	98	Hunt, G.	23	149
117	Goggins, J.	21	190	108	Adams, P. F.	0	149
128	Stilton, E. J.	23	190	127	Stilton, E. J.	15	149
87	Warrian, C. G.	16	188	82	Smith, E. R.	21	142

* Signifies bird laying under-weight eggs.

JOSEPH GARNER, Government Supervisor.

DEHORNING CATTLE.

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to start, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. In our experiments, six calves have been treated; their ages ranged from three to eighteen days. Healing soon followed the operation, and smooth polls have resulted in every case. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day. With older animals a dehorning instrument must be used.

PHOSPHORUS IN THE LIVE STOCK INDUSTRY.*

By

SIR ARNOLD THEILER, K.C.M.G., D.Sc., Dr.Med.Vet., Director of Veterinary Education and Research.

H. H. GREEN, D.Sc., Sub-Director of Veterinary Education and Research (Biochemical Section).

P. J. DU TOIT, B.A., Ph.D., Dr.Med.Vet., Deputy Director of Veterinary Education and Research.

I. INTRODUCTION.

The article upon "The Cause and Prevention of Lamsiekte," which appeared in the Journal for June, 1920, reviewed the recently-discovered significance of phosphorus in the etiology of the disease lamsiekte in cattle. At that time it was already realised that phosphorus-supply also played an important rôle in the *nutrition* of stock over wide areas of the Union, and experiments were therefore instituted to determine the extent to which it entered as an economic factor in beef production. A weighbridge was installed on the farm *Armoedsvlakte* at Vryburg, where the previous lamsiekte research had been carried out, and an extensive series of experiments planned. Some of these have had to be curtailed on account of locust depredations, drought, and the prevailing financial stringency; but others were successfully carried through, with results so striking that broadcasting to every cattle farmer in the Union is now fully justified.

Phosphorus is unquestionably a limiting factor in the growth rate of cattle, and a dominating factor in the maintenance of live-weight under ordinary conditions of veld grazing, so that the nutritional aspects of the investigations now altogether overshadow the original problem of disease. Since the areas over which the nutritional factors apply are far wider than those over which lamsiekte occurs, the annual financial gain to the stock-raising industry in the future can easily be made far to exceed the annual financial losses from lamsiekte in the past. Indeed, by focussing attention upon specific nutritional deficiencies of South African veld, the disease can almost be said to have been "a blessing in disguise."

Increase of milk yield of cows, better calves at birth, more rapid growth of young stock, and superior fattening of adult cattle, all follow simple bone-meal feeding, and agricultural propagandists might well carry the phrase "Bone-Meal for Beef" as slogan cry over all the phosphorus deficient areas of the Union.

The following diagram (Fig. 1) summarises the phosphorus problem as it effects, in varying measure, a very large proportion of the total acreage of South Africa; phosphorus deficiency being a general characteristic of South African soils, although the precise degree of deficiency in different districts remains to be mapped out.

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*In the "Journal of the Department of Agriculture," Union of South Africa, No. 5, Vol. VIII., 1924.

The various ramifications of this diagram are best considered separately.

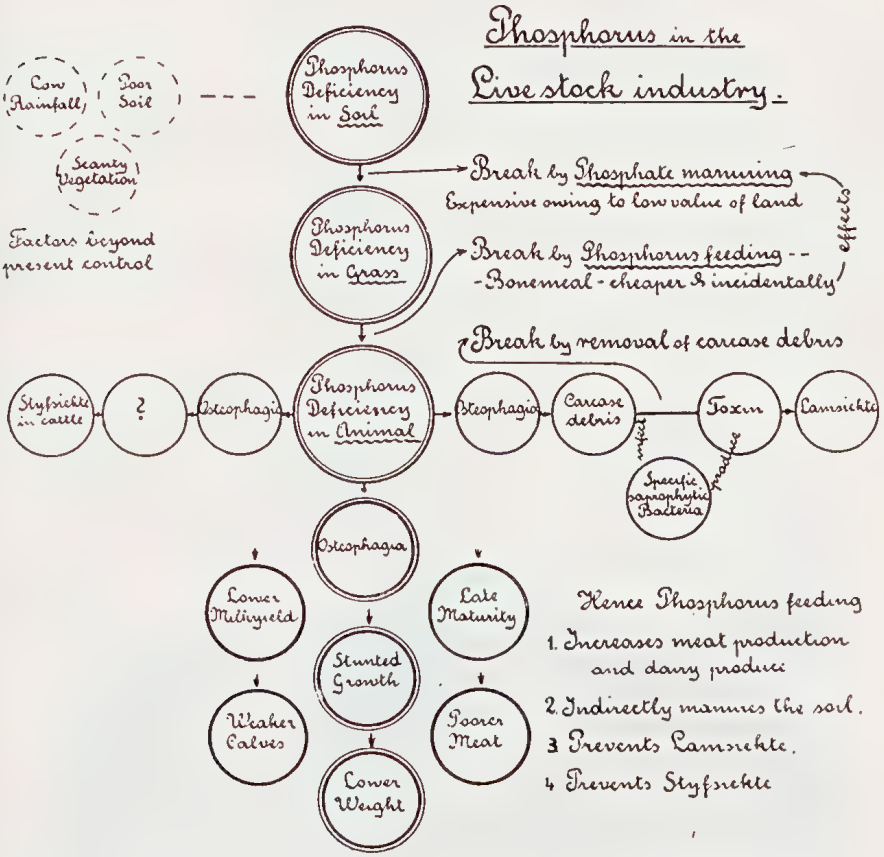


FIG. 1.

II. LAMSIEKTE.*

With regard to the disease lamsiekte little need be said, since the article of June, 1920, dealt with it in considerable detail. It need merely be noted that its position in the diagram explains it as an *indirect* consequence of phosphorus deficiency, the *direct cause* of the disease being a "ptomaine poisoning" brought about by infection of carcass debris with a specific toxicogenic saprophyte; an anærobic bacterium, reminiscent of, but not identical with, *Bacillus botulinus*. If the casual organism is missing, or if there is no protein substrate from which it can produce its toxin, there can be no lamsiekte, however acute the phosphorus deficiency of the vegetation may be. Hence there are wide areas of the Union over which one or other manifestation of phosphorus deficiency is apparent, but over which lamsiekte never occurs. If, on the other hand, there is no phosphorus deficiency in soil or vegetation, no "pica" (depraved appetite, or more specifically "osteophagia") is manifested by the cattle and they leave decaying carcass debris alone, however much of it may be scattered over the veld. They therefore never ingest the toxin and never contract lamsiekte. Hence there are areas in which both organism and substrate may be present, and yet in which the disease is unknown, simply because the soil is not deficient in phosphorus.

Lamsiekte may therefore be prevented *either* by cleaning the farm of all carcass debris *or* by feeding phosphorus compounds to the cattle. *Both* are recommended; the first on general hygienic grounds, the second for the reason that the cost of feeding bone-meal is *repaid many times over* in the improved condition of the cattle, quite irrespective of the insurance provided against the disease.

As the diagram indicates, the same result can be achieved by phosphatic manuring of the soil, but, as will be shown later, the cost is prohibitive for just those areas over which lamsiekte is most rife.

* Lamb sickness.

III. STYFSIEKTE.*

Again, with regard to this branch of the diagram (Fig. 1), little need be said at present, beyond stating that the disease styfsiekte is now under special investigation on the farm of Mr. Richards, *Shepstone*, in the Ermelo district; and that it can quite definitely *be prevented by feeding bone-meal* or other material containing sufficient digestible phosphorus.

It may indeed turn out to be an extreme form of phosphorus deficiency, a real "aphosphorosis"; or a mixed deficiency disease in which low lime as well as low phosphorus plays a part; or there may be an hitherto unsuspected link in its etiological chain.

It occurs on some phosphorus deficient soils, but not on others; is prevalent, for instance, on the Ermelo High Veld where lamsiekte is unknown, but absent at Vryburg where lamsiekte is prevalent. There is, therefore, an unknown factor, denoted by an interrogation mark in the diagram; which, however, will not disturb the practical farmer so long as he is satisfied that he can control the disease by *bone-meal feeding*. He can do this, easily and effectively, and in the process enormously *improve the condition of his cattle*.

FIG. 2.

IV. PHOSPHORUS DEFICIENCY IN THE ANIMAL.

So much, then, for the side branches of the diagram, ending with disease. The direct chain of events, commencing with poor soil and ending with poor beef, may now be considered. The lower part of Fig. 1 is of more interest to the cattle farmer, and may therefore be dealt with first, leaving consideration of soil and vegetation to the end.

Osteophagia.—This is the most obvious outward sign, or clinical symptom, of phosphorus deficiency in *cattle;* and although not infallible, is a very valuable indicator of such deficiency in the majority of veld-bred bovines. Curiously enough it is not shown to the same extent by other animals; is, for instance, only feebly manifested by sheep.

Osteophagia is a specific form of "pica" or "depraved appetite," showing itself as a special predilection for bones. In extreme cases "osteophagia" may pass over into "allotriophagia," in which specific discrimination is lost and the animal will chew any sort of rubbish at all. In its milder forms the abnormal appetite is quite finely adjusted, and only the best sun-bleached bones are eaten. In its more aggravated forms, any putrefying bones may be eaten, and it is not an uncommon sight to see "extreme cravers" crowding round the rotten carcass of a dead animal. The accompanying photograph (Fig. 2) shows "typical osteophagia" in the three animals. The attitude of all three is quite characteristic, and with the middle animal

* Stiff or starch sickness.

the white bone is clearly visible, sticking out of the left side of the mouth. The sound of "bone chewing" is usually easily distinguished, and if presented in the flesh these cattle would make quite a musical trio.

Owing to the nice discrimination displayed in typical osteophagia, it is possible to sort out a herd, for experimental purposes, into "marked cravers," "slight cravers," and "non-cravers." This is simply done by first offering sterilised "rotten bones"—*i.e.*, bones still possessing a distinctly putrid odour. The animals which will chew such bones are entered up as showing "marked osteophagia." The remainder of the batch are then driven over to another corner of the "testing kraal" and allowed access to "sweet bones"—*i.e.*, bones which have been well bleached in the sun, and which no longer possess a putrid odour. Any animals which will chew such bones are entered up as showing "mild osteophagia"; and the remainder, displaying no predilection for bones at all, recorded as showing "no osteophagia."

Fig. 3 illustrates a small scale test, using boxes for the test bones.

Four of the animals are clustering round the boxes. A fifth (extreme right) has taken a bone and is obviously chewing it with relish. The sixth, presenting a "scornful posterior" on the left, is apparently a non-craver. The method of "testing for osteophagia" can of course be varied to suit circumstances and, as succeeding charts will show, has proved of enormous value in investigating phosphorus deficiency in cattle.

Fig. 3.

Live-weight, condition, and growth.—The osteophagia just discussed would represent little more than an interesting curiosity to the farmer but for the fact that it is the precursor of disease and the index of defective nutrition in his cattle. Indeed, the South African farmer has not only known "pica" all his life, but has treated it as normal. In spite of the lamsiekte article of June, 1920, many farmers still disregard its significance, and it is one of the express objectives of this present paper to convince them that osteophagia means not only danger of disease, but consistently poor beef production. The next illustration (Fig. 4) shows two animals of the *same age* (about three years), both restricted to natural veld grazing, but one given an allowance of 3 oz. of bone-meal per day for about 15 months before the photographs were taken; and the other not.

The upper animal is a lean heifer taken in the attitude of osteophagia. It is obviously stunted in growth and poor in condition. The lower animal displays a creditable corpulence, shows no osteophagia, and is well grown for a veld-bred ox. Fifteen months before both were about the same weight, and the *only difference* in feeding was the *bone-meal ration*. This comparison is certainly selected, but as the following charts show, the *average* gains in live-weight from simple bone-meal feeding are quite extraordinary.

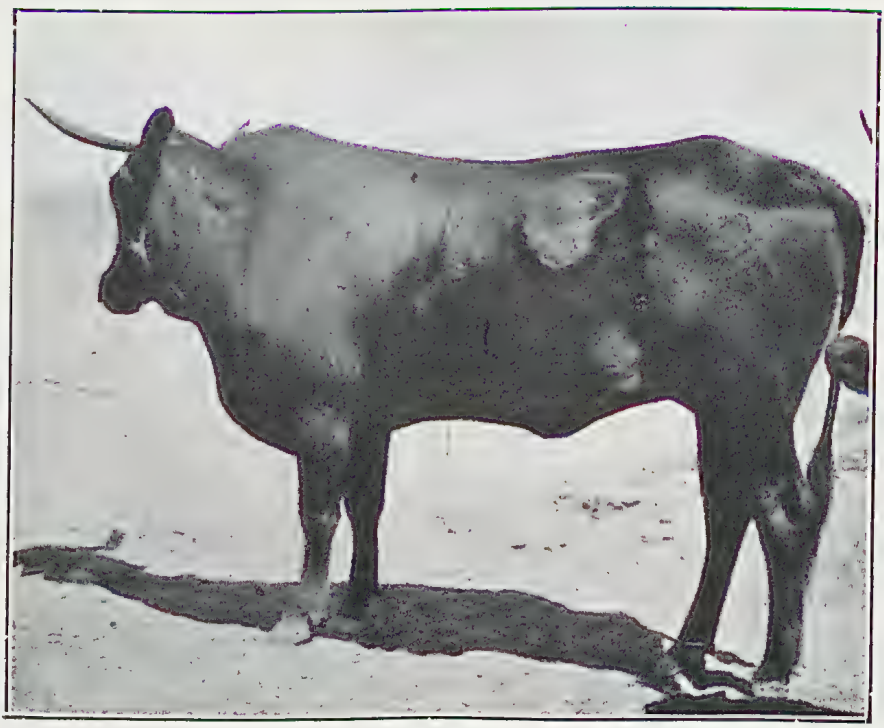


FIG. 4.

Gains of a Mixed Herd.—Fig. 5 charts the average weight of two similar batches, *fifty in each,* of mixed cattle of various ages from about two to seven years, one receiving a bone-meal ration, the other not. Both lots *average* about 700 lb. per head; a figure normal for a miscellaneous lean herd in the Vryburg District at the end of winter. Apart from the bone-meal ration both lots were *confined exclusively to natural veld grazing,* and the large number in each mob completely precludes fortuitous variation. The difference is therefore *solely attributable to the bone-meal*: 3 oz. per head per day, excluding Sundays, although as subsequent experiments have shown, the same results could have been obtained on less.

The experiment was commenced in June, a time at which the Armoedsvlakte veld had reached the dry winter stage. The grass was meagre, and owing to shortage of grazing, both lots diminished in weight until the end of September, although the bone-meal lot *lost less* and were at that time 25 lb. per head heavier. The first green grass of the season then began to appear on the dry veld and both batches commenced to pick up in condition. By May the control lot had fattened up to an average weight of about 800 lb. and the bone-meal lot to approximately 900 lb., the actual superiority averaging 105 lb. *per head.* This, it must be emphasized, is practically all extra butcher carcass. At the same time the *whole* carcass weight of the superior animals is worth more per lb. owing to its better quality, deposition of fat between the muscular fibres making for more tender saleable meat. Merely from the gross weight point of view, however, the control cattle gained 14 per cent. over a period of eight months, while the bone-meal cattle gained 29 per cent., or more than double.

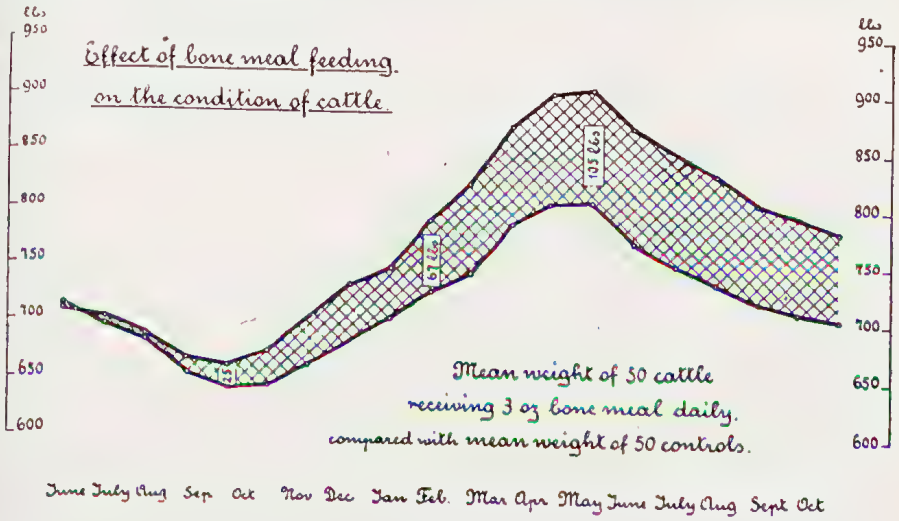


FIG. 5.

Of further general interest in this curve is the *winter fall* in live-weight of animals confined to the poor pasture of a drought season; a common experience in Bechuanaland and all regions of low rainfall. As will be shown later, the feeding value of the grass after the seed has fallen is at best not really high. During the past season the available supply was scanty in proportion to the stock carried by the farm, and the young grass of the ensuing year delayed by drought. Both batches lose in condition, the controls dropping back to their initial average weight of 700 lb. shown at the commencement of the experiment and, therefore, showing practically no commercial profit for the year's grazing. Although the bone-meal lot also lose about 100 lb. per head in weight, through simple semi-starvation on the poor winter pasture, they nevertheless *maintain the advantage* gained during spring and summer, survive the winter 100 lb. heavier than the controls, and are ready to increase that advantage still further the moment the veld improves.

In a good year the winter loss may be avoided, although it is rare to find animals in this region actually gaining appreciably in weight during the months June to September. In all these areas of poor soil and low rainfall, however, where it is exceedingly difficult to grow and store winter feed for stock, a winter loss of anything from 5 to 20 per cent. in live-weight, according to season, has to be faced; and the gains only counted upon during the spring and summer months. This point, so disadvantageous to a beef export trade, will be referred to again in discussing the composition of the vegetation.

Gains of Young Oxen.—If bone-meal feeding is commenced earlier in life the difference in live-weight is still more pronounced, since growth as well as fattening is enhanced by removal of the phosphorus "limiting factor." Fig. 6 summarises the results with young oxen, weighing about 650 lb.

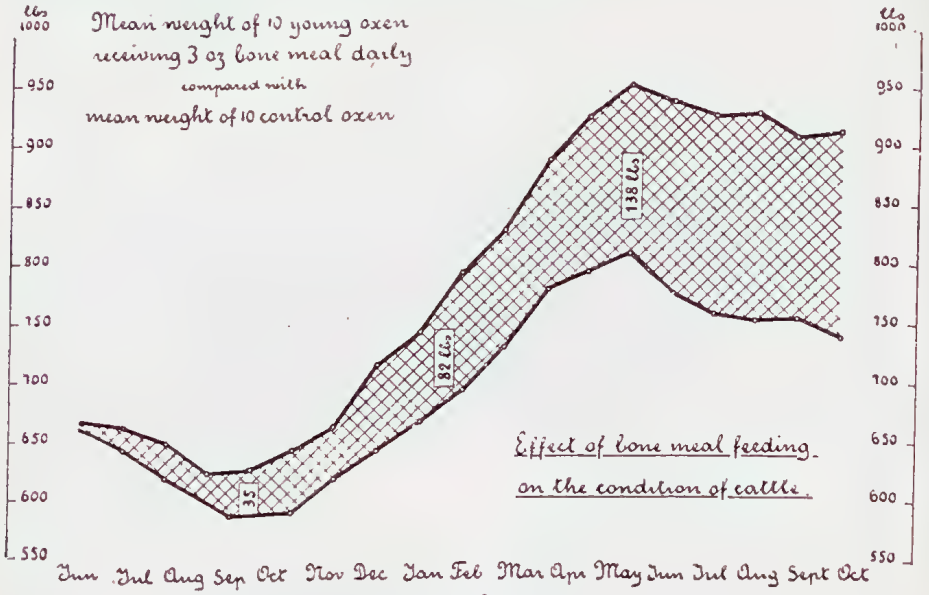


FIG. 6.

As with the previous mixed herd, both batches lose weight from June to September, owing to the poor quality of the winter pasture. The lot receiving bone-meal, however, make better use even of the poor veld, *lose less*, and at the turning point of spring are still 35 lb. heavier per head. Fattening up, and growth, then proceeds upon the new veld vegetation, and by May even the controls have increased to about 800 lb., or by 21 per cent. The bone-meal lot increase to 950 lb., 42 per cent., or *twice as much* as the lot receiving no bone-meal; showing a clear superiority of 138 lb. per head. Calculating upon the initial weight, this represents an extra gain of over 20 per cent. within a year, solely as a result of bone-meal feeding. The real extra profit is still higher, since on a keen competitive market the superior animals find a ready sale, while the controls run the risk of "kaffir meat prices." An auctioneer's valuation showed an extra cash value of £3 per head in favour of the bone-meal lot, as against an actual expenditure of six shillings (55 lb.) for bone-meal. A glance at the next photograph, Fig. 7, showing a selected individual (the youngest) from each lot, will leave no cattle farmer at variance with the auctioneer.

FIG. 7.

A year before, these two animals were approximately the same weight. The difference in butcher quality and in market value is obvious.

Regarding Fig. 6, it may be noted further, that during the latter period May-October the "winter loss," already discussed, is again apparent, but is less pronounced than in the preceding year. The point of interest is that during this winter the bone-meal batch practically retain their gain and so indirectly increase their lead from 138 lb. to 170 lb. per head.

Specific Influence on Growth.—When bone-meal feeding is commenced still earlier, and the influence of phosphorus upon *growth* is allowed fuller play, the

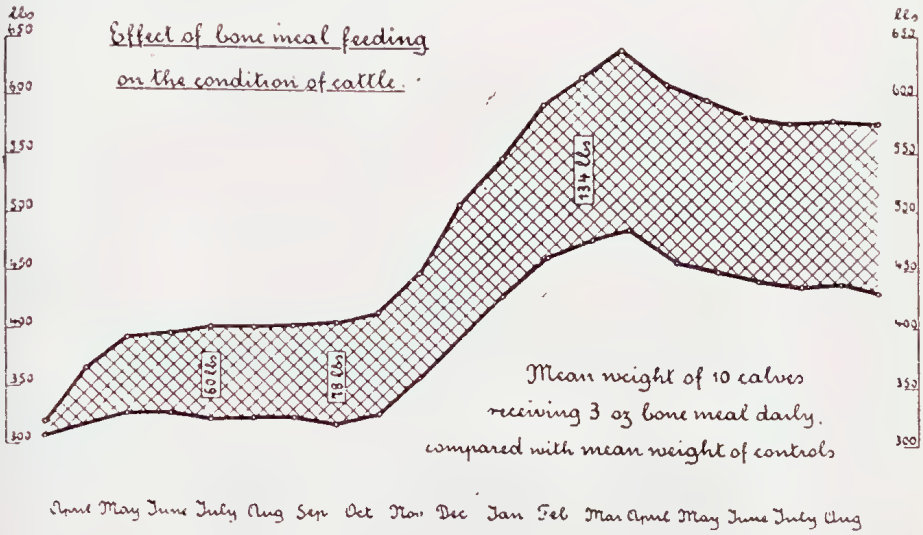

Effect of bone meal feeding
on the condition of cattle.
134 lbs.
160 lbs.
18 lbs.
Mean weight of 10 calves
receiving 3 oz bone meal daily.
compared with mean weight of controls
April May June July Aug Sept Oct Nov Dec Jan Feb Mar April May June July Aug

FIG. 8.

results are still more striking. Fig. 8 shows the curves obtained with calves from 9 to 18 months old, in an experiment commenced in April, 1921. These calves commenced at an average weight of 300 lb. On the quantitatively sufficient, but

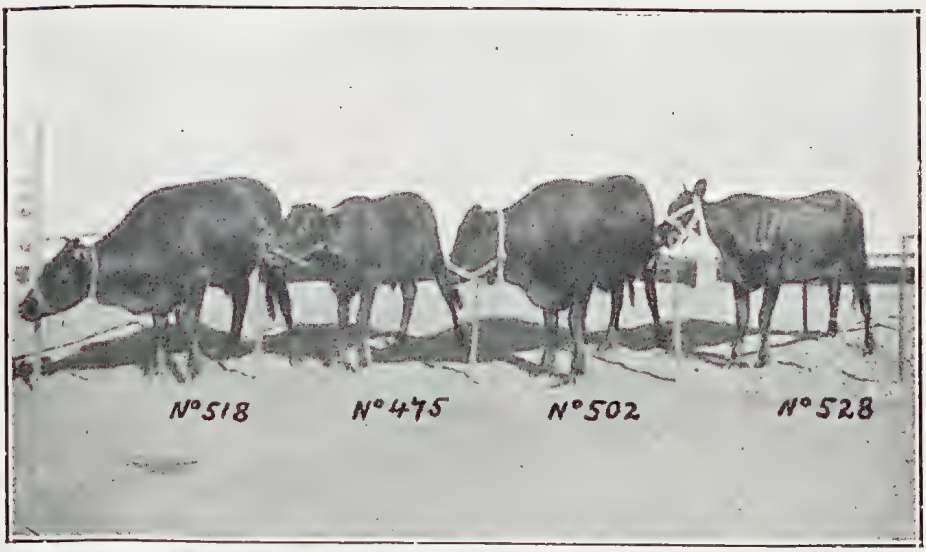


FIG. 9.—Showing Influence of Phosphorus on Growth of Cattle, otherwise restricted to Natural Grazing.

Weight.	No. 518.	No. 475.	No. 502.	No. 528.
January, 1922	310 lb.	319 lb.	304 lb.	297 lb.
May, 1923	755 lb.	465 lb.	726 lb.	451 lb.
Increase	445 lb.	146 lb.	422 lb.	154 lb.
Bone-meal ration	3 oz.	Nil	3 oz.	Nil

phosphorus deficient, veld vegetation of April and May, the controls make practically no progress, while the bone-meal batch gain 60 lb. per head; 20 per cent. in two months. From June to October the amount of winter grass was sufficient to keep both lots from falling off in weight, and allow the bone-meal lot to increase their lead to 78 lb. per head. From October to April the new grass provided relatively abundant feed, of better (less deficient) phosphorus-content during the earlier period of growth, and even the controls increase to 480 lb. The bone-meal lot, however, increase to well over 600 lb., the actual superiority being 134 lb. per head. During this period there can be no doubt that the lack of phosphorus in the grass is the *limiting factor* in the growth of these calves, a fact which will presently be correlated with analyses of the grass over these months of the year.

Calculating on the basis of the initial weight of 300 lb., the actual increases are 60 per cent. for the controls, but 105 per cent. for the lot receiving the bone-meal ration; the latter having more than *doubled their weight.* The bone-meal batch also increased more in *size, i.e.,* in skeletal development, so demonstrating the specific effect upon growth. As pictorial illustration of this the following photographs are of great interest. Fig. 9 shows four animals *not* selected because they make a pretty picture, but originally picked out on the basis of similarity in weight, age, and appearance, over a year before the photograph was taken. The exact experimental protocols are included in the legend to the plate.

It will be noted that No. 518 has increased more than *three times as much as* No. 475 in sixteen months, although actually the smaller animal at the commencement. No. 528 is similarly stunted by comparison with No. 502, its phosphorus-fed fellow. Subsequent experience has shown that results nearly as good can be obtained with less bone-meal than actually used in this experiment, although a liberal ration is always surer. These animals are *representative* of the general results of phosphorus feeding, now recorded for hundreds of cattle; more representative than the dramatic differences shown in Fig 4 and Fig 7, but sufficiently striking to convince any progressive farmer of the need for bone-meal feeding on phosphorus deficient soils. Although bone-meal is here used as source of phosphorus, wheaten bran or other palatable, digestible, phosphorus rich supplement, serves the same purpose. This point will be mentioned again in discussing the phosphorus-content of the veld vegetation. (Fig. 24.)

Is the Amount of Phosphorus required to Prevent Osteophagia the Optimum for Growth?—When the Armoedsvlakte feeding experiments were commenced, the two functions of bone-meal were kept in view:—(*a*) Prevention of lamsiekte by obviation of osteophagia, and (*b*) improvement in growth and condition by obviation of nutritive deficiency of the pasture. Shortly afterwards (1921) an attempt was made to measure the phosphorus requirements of different classes of animals by determining the minimum amount required to prevent osteophagia, and to estimate the phosphorus deficiency of the veld at different seasons of the year by noting the variations in amount of phosphorus required to supplement it, correlating the latter with actual analyses of the vegetation. "Osteophagia Equilibrium" experiments were then devised, in which the daily ration of bone-meal was varied every week upon the basis of a weekly test for osteophagia. If during any week the craving for bones disappeared, the daily ration of bone-meal was dropped slightly. The moment the craving returned, the ration was raised slightly. In this way the cattle were kept just on verge of osteophagia, and the actual amount of bone-meal required to maintain this "equilibrium" charted against season (or time) for cows, calves, growing stock, and adult oxen. The results are given below.

It was then found that, although osteophagia is an excellent *general guide* to phosphorus deficiency, and a *certain indication* of susceptibility to lamsiekte in presence of the other essential links in the etiological chain of that disease (Fig. 1), it is by no means infallible as a measure of the need for phosphorus in nutrition. Although osteophagia nearly always (with the exception of a few "habitual" or "chronic" cravers) indicated nutritional need for phosphorus, quite a number of animals (especially young stock) failed to display osteophagia even when their

nutritional need could be readily demonstrated by a dietetic experiment. Furthermore, osteophagia only appeared (in general) at a level of deficiency distinctly below the optimum requirements from the nutritional point of view. Figs. 10 and 11 illustrate this. The animals are young calves originally selected from the stock at disposal, on the grounds of *uniformity* in age, size, weight, and appearance. They belong to a "skeletal development" experiment, and will finally be slaughtered for study of their bones. Fig. 10 compares a control receiving no bone-meal with a similar individual receiving "just sufficient" bone-meal to prevent osteophagia, and with a third, originally similar calf, fed upon "excess" bone-meal (3 oz.). The legend supplies the detailed protocols.

As will be seen, the increase in weight over sixteen months is 166 lb. for the control; 295 lb. for the animal receiving just enough phosphorus to prevent osteophagia, 15 lb. of bone-meal in all; and 352 lb. for the animal receiving excess bone-meal, 75 lb. in all or 3 oz. per day except Sundays. It is quite obvious that the amount of bone-meal required to prevent osteophagia effects an enormous improvement in growth, but is not quite the *optimum*. It has the effect of almost doubling the rate of increase, and yet a further supply allows of a further increase of 57 lb. over 295 lb., or approximately a further 20 per cent. The precise additional amount

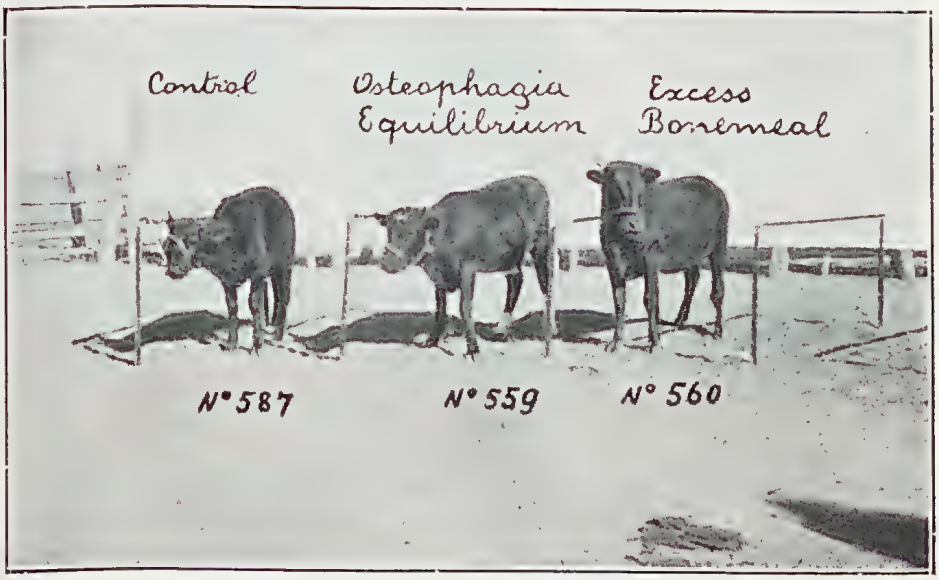


FIG. 10.—Showing that the Amount of Phosphorus required to prevent Osteophagia and so protect against Lamsiekte is not the Optimum for Growth.

Weight.	No. 587.	No. 559.	No. 560.
January, 1922	224 lb.	237 lb.	226 lb.
May, 1923	390 lb.	532 lb.	578 lb.
Increase	166 lb.	295 lb.	352 lb.
Total bone-meal supplied	Nil	15 lb.	75 lb.

of bone-meal required to produce the optimum effect is not yet known. The actual amount supplied to No. 560 was five times as high as that supplied to No. 559. The 3-oz. daily ration is obviously unnecessarily high, and even 1 oz. (25 lb. total) might have proved sufficient to effect maximum improvement. Experiments are now in progress to determine the *most economical* amounts of bone-meal for various classes of cattle as distinct from the "most beneficial." The "bone-meal bill" is an important item with ranching farmers, who are little concerned with the manurial value of the phosphorus after the animal has done with it; and in some cases it *may* pay to take a "good return" in beef on a small bone-meal bill, rather than the "maximum return" on a higher initial outlay. The probabilities, however, are that the optimum live-weight and optimum economy will lie very close together; and

that when the former is more accurately determined than it has been in the past series of experiments, the latter will prove close enough to render distinction superfluous.

The companion picture, Fig 11, illustrates the second point, *i.e.*, that some animals may never show osteophagia at all, and yet profit enormously by bone-meal feeding.

The legend explains itself. Control calf No. 568, rather over a year old when the experiment started and in its third year when photographed in May, 1923, increased 225 lb. in weight in sixteen months on the natural grazing without bone-meal. No. 569 was to have got as much phosphorus as it "asked for" in the osteophagia tests; but since it *never showed craving* it never got any bone-meal.

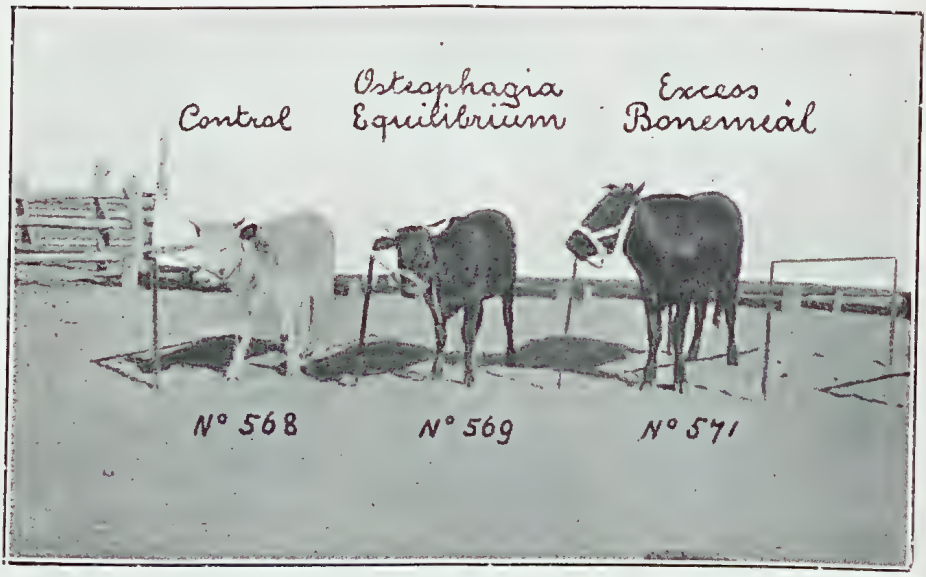


FIG. 11.—Showing that Nutritional Deficiency of Phosphorus is *not always* reflected as Osteophagia.

Weight.	No. 568.	No. 539.	No. 571.
January, 1922	236 lb.	238 lb.	233 lb.
May, 1923	461 lb.	472 lb.	714 lb.
Increase	225 lb.	234 lb.	481 lb.
Total bone-meal consumed	Nil	Nil	75 lb.

No. 569 received no bone-meal simply because it never showed Osteophagia.

It behaves exactly like the control, increasing to about the same weight on the natural pasture, and remaining far behind No. 571, which got excess of phosphorus whether it asked for it or not. At the commencement of the experiment, No. 571 also showed no osteophagia, but being liberally supplied with bone-meal, never got a chance of developing it. Whether it would have developed osteophagia if it had not been so fed remains doubtful; probably it would not, since a fair proportion of the calves in this experiment only developed the bone-eating habit after two years. At any rate it got bone-meal (by the "crush method" described below) and made more than twice the gain in weight of either the control or the "osteophagia equilibrium" animal, which *would* have received at least *some* bone-meal if it had reflected its requirements by displaying craving.

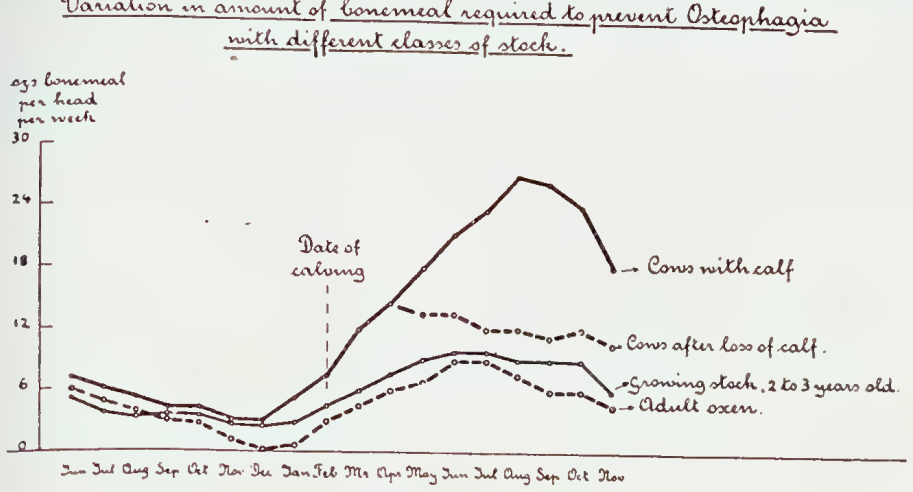
Requirements of Different Classes of Cattle.—The next chart, Fig 12, shows the varying amounts of bone-meal required to prevent osteophagia in different classes of cattle, as determined by the method of "osteophagia equilibrium" just described.

It may first be noted that the amount of phosphorus required varies with the season of the year, falling as the richer young grass of spring becomes available, and rising again as the grass matures. This point will be more fully discussed in considering the chemical composition of the pasture (see Fig. 23).

Glancing at the curve for adult oxen, it is apparent that phosphorus requirements are lowest for animals which made demands only for *maintenance*, but not for growth or reproduction. For this class of stock 6 oz. to 9 oz. of bone-meal per

week provide sufficient phosphorus to prevent osteophagia, even during the worst period of the year (winter grazing, May to August); while during the period of very young grass practically no bone-meal is needed, the proportion of phosphorus in the vegetation itself (Fig 23) being then sufficient for mere maintenance.

With young growing stock the requirements are a little higher than for oxen, apparently varying from 2 oz. to 10 oz. per head per week according to the season of the year, *i.e.*, according to the stage of growth of the grass. Expressed upon the basis of live-weight, the difference "per 1,000 lb." would be even more marked, but for the present the curves are purposely left to reflect "classes of stock" irrespective of weight: for three reasons—(1) that the ranching farmer thinks in terms of class and age rather in terms of individual weight, (2) that the experimental animals were "stunted" to begin with, and "potential capacity to grow" is more important than initial weight, and (3) that the *ratio* of "phosphorus" to "energy value" of the grazing, which remains the same irrespective of the weight of the animal and the weight of food eaten, is probably the most important factor (see below). The curve therefore reflects the fact that *growing stock* require slightly more bone-meal


Variation in amount of bonemeal required to prevent Osteophagia with different classes of stock.
ozs bonemeal per head per week
30
24
18
12
6
0
Date of calving
Cows with calf
Cows after loss of calf.
Growing stock, 2 to 3 years old.
Adult oxen.
Jun Jul Aug Sep Oct Nov Dec Jan Feb Mr Apr May Jun Jul Aug Sep Oct Nov

Composite chart for an average year, semi-diagrammatic, interpolated from miscellaneous data of "Osteophagia Equilibrium" experiments.

FIG. 12.

than adult oxen, in spite of the fact that the latter are larger and heavier animals; further, that they require it all the year round.

Coming now to the curve for *breeding cows*, the difference in phosphorus requirements is shown as very much greater, and it is apparent that the main demand for the extra-bone-meal is for *milk production*. The first part of the curve shows that the extra demand for the early period of pregnancy is not great, the amount of bone-meal being only about 2 oz. per head per week higher than for oxen. During the last two months of pregnancy, however, the demand increases and at the time of calving is considerably higher than for oxen. Thereafter the requirements for bone-meal increase rapidly owing to the *combined factors* of *season* and *lactation*; increasing age of the grass being accompanied by decreasing phosphorus-content (Fig. 23); and milk production requiring relatively much phosphorus for the manufacture of casein, a *phosphoprotein*. In August as much as 28 oz. of bone-meal per week are required to prevent osteophagia; an average of 4 oz. per head per day, or nearly 5 oz. per "week day" if the routine of administration excludes Sundays (see below).

The sharp fall in the curve after July or August is to some extent due to the appearance of a few green shoots on the deeper rooted plants, but mainly due to natural *drying up of the milk flow*. About this time the calves are largely feeding for themselves, and natural weaning commences. If the mothers still have sufficient milk they give it; if not, they discourage their offspring, with hoof and horn, and only the moist persistent youngsters secure appreciable quantities.

If, for any reason, the cow loses her calf she naturally "goes dry" soon after, and her phosphorus requirements fall in proportion. The broken branch-line of Fig. 12, showing "cows after loss of calf," is interpolated from several cows which

lost their calves from one to three months after birth. The bone-meal requirements at once diminished, and the fact that they remain higher than for oxen is probably due to the fact that the cows are recuperating a previous drain upon the system; in less measure to the fact that they may be again nourishing a calf *in utero*.

Summarising the lesson of this chart (Fig. 12) it may be stated that in general, for conditions of the Armoedsvlakte type, oxen require a supplement ranging from nil up to 1½ oz. of bone-meal per head per day (excluding Sundays), depending upon the season of the year and the state of the veld; growing stock ½ oz. up to 2 oz.; heifers much the same, but increasing to 2 oz. as they become breeding cows and rising to 5 oz. during the lactation period. This is for *prevention of osteophagia*, prevention of lamsiekte, and marked improvement in condition. For *optimum* growth and condition, the quantities recommended would be distinctly higher, and more uniform throughout the year. Each farmer has to be guided by his own experience on his own farm in deciding how much bone-meal he can profitably feed, but as a basis upon which to work the following figures should prove a useful starting point: 1 oz. per day for calves up to 18 months; 2 oz. to 3 oz. for the remainder of the growing period; back to about half this for old oxen for mere maintenance of good condition; up to 5 oz. for cows with calf at foot. For dairy stock of *high milk yield* the owner should cheerfully go up to 8 oz. unless he is using supplementary rations containing wheaten bran; in which case he can reduce his bone-meal allowance by about 1 oz. for every 1 lb. of bran he feeds. For such stock, which give an *immediate return* in milk sold off the farm, he will find that it pays to go on increasing his phosphorus ration until he is satisfied that

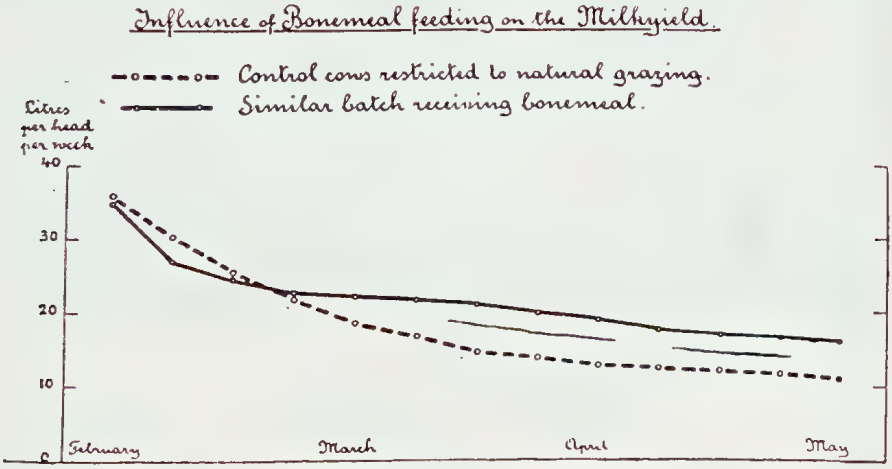


FIG. 13.

he is getting the maximum milk yield from cows maintained in good sleek condition. A "staring coat" at least deserves trial on a higher ration. If his cows are kraaled or stalled in such a way as to render collection of manure at all feasible, it should be remembered that a large proportion of the phosphorus goes out in the dung and that this will work wonders with any land he has under cultivation (*cf.* Pot. 56, Fig. 26).

Influence on Milk Yield.—That milk production imposes a severe strain upon the phosphorus reserves of an animal is a well-known fact. Indeed, recent American work goes to show that a lactating cow is usually in "negative phosphorus balance"—*i.e.*, may lose phosphorus from her own reserves (skeleton) even on an ordinary ration. On the phosphorus deficient veld of Armoedsvlakte the strain is reflected through osteophagia in the manner just discussed. On the Ermelo high veld it is reflected in the same way, but is further demonstrated by the prevalence of "styfsiekte" (stiff-sickness) amongst cows at or after, calving; and by the tendency to recover from that disease if the calf is taken away and the milk flow allowed to dry up. It may, however, be demonstrated directly on the *milk yield itself*, as shown in Fig. 13.

This chart shows the *immediate effect* of phosphorus upon milk production. Ten ordinary veld cows were selected and milked from alternate halves of the udder on alternate days, leaving the other half for the calf. The data so obtained were doubled for "total yield," and preliminary records kept for a few weeks. They were then divided into two batches of five in such a way that the total yield was approximately the same for both. Both lots were restricted to the ordinary veld grazing, but one was given a ration of bone-meal (8 oz., to ensure experimental

excess) and the other not. The milk yield at once responds to the phosphorus supplied, and the bone-meal batch averages about *40 per cent. more milk*. Low phosphorus is therefore a *limiting factor in milk production*. The actual milk yields shown, 35 litres per week, or about 5 litres (about nine pint bottles) a day, dwindling to half this after a few months, are low owing to the nature of the stock; ordinary Afrikander crossbreds giving merely enough to bring up their calves on the veld, and doing even this under adverse conditions of food supply. With *dairy stock* the differences would unquestionably be much more striking, when expressed in litres or gallons, and experimental data for the benefit of the dairy farmer are now being acquired. It is practically certain that these experiments will show a very substantial profit upon the monthly milk bill for every ounce of bone-meal fed.

The data of Fig. 13 only show the benefit derived by the sucking calf as an *immediate result* of feeding bone-meal to the mother. Either Fig. 4 or Fig. 7 will convince the reader of the much greater benefit derived from more prolonged phosphorus feeding. The superior heavier animal (if a cow) is obviously going to supply much more milk than the stunted one. A single year's continuous bone-meal feeding works wonders with both mother and offspring. Precise statistics in this direction are now being acquired.

Weight and Vigour of Calf at Birth.—Such statistics are at present limited since, as mentioned in the introduction, drought and locust depredations reduced the stock-carrying capacity of the Armoedsvlakte veld and compelled curtailment of some of the most interesting experimental work. Nevertheless, the meagre existing data point unmistakably to the fact that the calves born of phosphorus-fed mothers average from 10 to 20 per cent. heavier than calves born of controls. They are also stronger, get more milk from their mothers, and so get a *better start in life*. It is not desired to labour this point, however, since it is one of the wise provisions of nature that during the period of gestation the mother sacrifices herself for her offspring; and many a scarecrow cow throws a fine calf. This is particularly noticeable in the styfsiekte areas, where the mother develops the disease mainly through the sacrifices she makes in nourishing her calf during late gestation and early sucking. The calf usually gets along quite creditably so long as the mother's milk holds out, a real "stunting of growth" becoming manifest only after weaning, when it has itself to rely upon the veld grass on which its mother bred it. Nevertheless, in spite of the capacity for maternal sacrifice, removal of phosphorus deficiency by bone-meal feeding of the cows gives a superior crop of calves.

Age of Maturity.—The phrase "crop of calves" may be used to recall the "late maturity" shown in Fig. 1. Wtih the limited data at present available the influence of bone-meal feeding upon the number of calves born per annum from a given number of cows is difficult to state with precision. The available data suggest "reduced fertility" under phosphorus deficient conditions of nutrition, even with cows which have already borne their first calf and should be capable of annual calving thereafter; but alien factors have not been excluded sufficiently to allow of simple interpretation. That phosphorus deficiency *delays growth* has already been shown, however, and a study of Figs. 7 and 10 will probably convince most readers that it also *delays maturity* in the breeding sense. The data, unfortunately, are not yet sufficiently clear-cut for charting upon a numerical basis, and the question may therefore be left for a later article.

Quality of Meat.—This item of Fig. 1 has already been referred to, but owing to its importance in the beef trade, is worthy of emphasis under a separate heading. As earlier photographs show (*e.g.*, Fig. 7), phosphorus-fed cattle are much heavier, carry more meat and fat in proportion to skeleton and entrails, and therefore yield a *higher proportion* of their live-weight in the form of butcher's *dressed carcass*. In addition, they reach a profitable butcher-weight at an earlier age, their muscle-fibres are more liberally interlarded with fat, and their meat is therefore more *tender*. In short, they are nearer "prime condition" and fetch a higher price "per 100 lb. on the hoof." Indeed, the difference in *quality* may make all the difference between an animal saleable at any time on any market and an animal only saleable at all on a market short of first-grade meat. This question of *quality* is of obvious importance if South Africa is to compete on the markets of the world and realise her dream of a *beef export trade*.

V. INFLUENCE OF PHOSPHORUS UPON FOOD CONSUMPTION.

Figs. 4 to 11, bringing out the difference in meat production effected by phosphorus feeding, at once raised a very interesting question. Do cattle receiving bone-meal *eat more food* in putting on the extra weight, or do they *utilise their food better* without actually eating more of it? The experimental data charted in Fig. 14 partly answer this question.

In this experiment the cattle had to be stabled, since it is impossible to measure the amount of grass eaten in the process of grazing. Twelve half-grown cattle were taken from the veld and divided into two lots of six, in such a way as to give the same aggregate weights; averaging, as the chart shows, about 450 lb. per head. They were then so stalled that the food eaten could be accurately controlled, and fed upon a basal ration *low in phosphorus*, but *adequate in energy value*, and of "sufficient," although by no means liberal, *protein-content*. These conditions were fulfilled by giving a fairly high *fixed ration* of flaked maize, so-called "Fanko," a high-grade rolled maize endosperm sold for human consumption, and selected on account of its very low phosphorus-content as compared with its relatively high energy value (·001 P_2O_5 per unit starch equivalent). Teff-hay of fair quality, but lower than usual in phosphorus-content (varying around ·16 per cent. P_2O_5) owing to its origin from phosphorus-poor soil (Ermelo District), was then supplied *ad libitum* from overhead racks, and the amount *voluntarily eaten* duly recorded. Both lots were treated in exactly the same way except for the supplement of 3 oz. bone-meal per head per day, to vary the phosphorus-content;* the periods of bone-meal feeding being indicated on the chart (Fig. 14) by continuous lines, as against dotted lines for

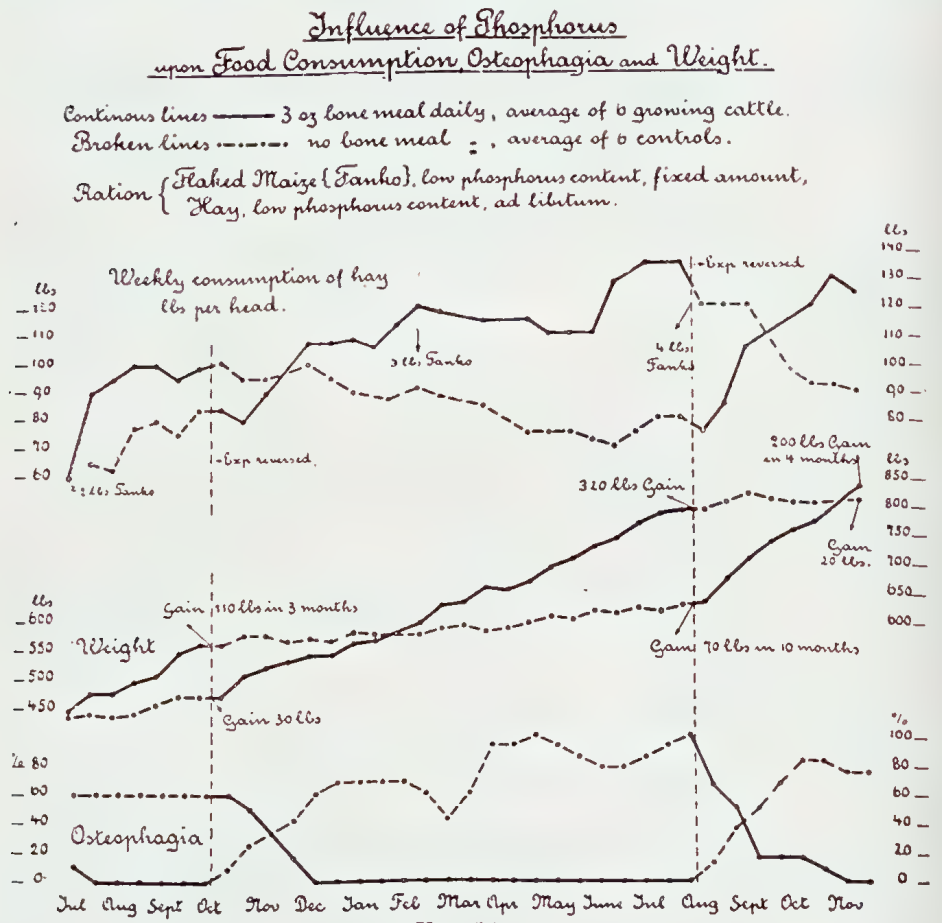

Influence of Phosphorus
upon Food Consumption, Osteophagia and Weight.
Continous lines ——— 3 oz bone meal daily, average of 6 growing cattle.
Broken lines -.-.-.- no bone meal " , average of 6 controls.
Ration { Flaked Maize (Fanko), low phosphorus content, fixed amount,
Hay, low phosphorus content, ad libitum.
Weekly consumption of hay
lbs per head.
3 lb. Fanko
4 lbs. Fanko
2½ lb. Fanko
Exp reversed
Exp reversed
200 lbs Gain in 4 months
320 lbs Gain
Gain 20 lbs.
Gain 110 lbs in 3 months
Gain 70 lbs in 10 months
Gain 30 lbs
Weight
Osteophagia
Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May June Jul Aug Sept Oct Nov

FIG. 14.

periods during which no bone-meal was supplied. Since the hay was offered *ad libitum* the phosphorus intake of even the control cattle varied throughout the experiment, but since the fixed ration of fanko always contributed a considerable proportion of the total diet the cattle receiving no bone-meal always got *too little phosphorus*. Records for osteophagia and live-weight are also shown on the chart for the whole period of experiment. The detailed protocols will be considered in a more technical paper, but even in a popular article the following features of the curves may be emphasised:—

(1) The cattle receiving bone-meal *eat more hay*, increase more in weight, and lose their osteophagia. For the first three months the controls retain their osteophagia, gain only 30 lb. per head in weight, and eat from 60 to 80 lb. of hay per head per

* NOTE.—Other minerals sufficient in basal ration.

week, or about 10 lb. of hay per day in addition to the 2 lb. of fanko. The cattle receiving bone-meal promptly lose their craving, eat 90 lb. to 100 lb. of hay per week, or about 4 lb. *more* per day, and gain 110 lb. per head in weight—practically *four times* as much as the controls receiving no bone-meal.

(2) At this point (October, 1922), the experiment was "crossed" in order to make quite sure of excluding potential idiosyncratic differences between the two groups—*i.e.*, the bone-meal was *taken away from one lot* and *given to the other lot.* The effect is very striking. Within a month the osteophagia curves and hay consumption curves cross—*i.e.*, *the osteophagia returns* and the *food consumption diminishes* in the lot from which the bone-meal was *taken away;* while osteophagia disappears and food intake rises in the lot to which the bone-meal ration was transferred.

The weight curves respond in the same direction, and within four months the previously inferior controls have not only made up their leeway of 80 lb., but have actually surpassed the lot deprived of bone-meal. At the end of ten months they have gained 320 lb., or more than four times as much as the previously superior batch. Indeed, the latter remain almost stationary in weight for a considerable portion of the time.

(3) The experiment was then *crossed again—i.e.*, the bone-meal once more transferred from one batch to the other. The same behaviour is again shown. The "osteophagia" and "hay consumption" curves again cross in a few weeks, and the "weight curves" in a few months. The rate of increase in weight of the lot now deprived of bone-meal at once drops; indeed, only continuing to rise by 20 lb. over the first few weeks after the change, and then remaining practically stationary; so suggesting that the phosphorus in the basal ration was sufficient for bare maintenance, but not sufficient for growth or fattening. On the other hand the rate of increase in weight of the other batch, formerly without bone-meal, rises the moment bone-meal is given, and a gain of over 200 lb. is made in four months.

(4) The weight curves over the whole period of seventeen months thus indicate quite clearly that phosphorus (bone-meal) is a *limiting factor in growth* and also a limiting factor in "voluntary food consumption," or "appetite." Taking the upper curve (initially), it is noted that so long as phosphorus is adequate the average increase of the six cattle is 37 lb. per head per month from July to October, a normal increase for mongrel stock when the indifferent character of the diet is considered. With a better class of stock (beef breed) and a more varied diet, richer in protein, the rate of increase would naturally be much higher. When bone-meal is *withdrawn* this 37 lb. per month drops to 7 lb. per month—*i.e.*, the growth rate is reduced to *one-fifth.* Once more inserting the bone-meal ration, the rate of increase develops to 50 lb. per month, or over *sevenfold.* The fact that the rate from August to November, 1923, is about a third *faster* than in August, 1922, in spite of the fact that the cattle are now a year older, is interesting from the point of view of "retention of the capacity to grow." It looks just as if the "growth impetus" had been "held in check" over the whole year on the phosphorus deficient ration, and then "suddenly released" the moment the missing phosphorus was supplied, the subsequent enhanced rate of progress almost suggesting an attempt to make up for lost time.

The corresponding curve for hay consumption of this batch shows that, although more hay was certainly consumed during the periods of most rapid increase, the difference is *not sufficient to account for the extra body weight put on.* This is not quite so obvious from the long period of ten months during which the bone-meal batch were increasing, roughly, 1 lb. per day faster than the controls and eating, roughly, 5 lb. more hay per day in doing it, but is strikingly apparent for the last period, August-November, 1923. Dividing this period according to the week in which the food consumption curves crossed, the protocols are as follows:—

Actual hay eaten per head in addition to fixed ration of 4 lb. fanko.				Live-weight,			Average per head.		
—	14th Aug. to 2nd Oct.	2nd Oct. to 27th Nov.	Total.	14th Aug.	2nd Oct.	Increase.	27th Nov.	Further Increase.	Total Increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lot A ..	724	956	1,680	625	750	125	835	85	210
Lot B ..	935	770	1,705	790	810	20	810	Nil.	20

FIG. 15.

It will be noted that between 14th August, when the bone-meal was taken away from Lot B and given to Lot A, and 2nd October, when the hay consumption curves cross, Lot B still continued to eat more hay, but only gained 20 lb. per head in weight, as against 125 lb. gained by Lot A eating 211 lb. *less* hay over the eight weeks. By this time the weekly hay consumption of Lot A had increased as that of Lot B diminished, so that in the following eight weeks the position is reversed, Lot A eating a total of 956 lb. per head as against 770 lb. for Lot B—a difference of 186 lb. of hay, accompanied by an increase of 85 lb. in live-weight. Over the whole period of sixteen weeks, however, Lot A have actually eaten 25 lb. *less* total hay than Lot B, but in this short time have not only made good their August arrears of 165 lb. in body-weight, but actually show a gross gain of 210 lb. per head, passing Lot B by an average of 25 lb. There seems to be no escape from the conclusion that phosphorus-fed animals *utilise their food better* and put on more *body weight per unit of food consumed.*

In *both cases* the average energy value af the food is well *above maintenance requirements.* Taking even the last period during which the weights of the two lots were similar, Lot B consumed an average of 16 lb. of hay per day as against 16.8 lb. for Lot A. Adding the fixed ration of 4 lb. of fanko, completely consumed by both lots, the difference in total "fuel value," or "food value," of the two diets becomes very small. Making a *conservative* estimate from analyses of the ration, the "starch equivalent" for Lot A works out at about 8.8 lb. per head per day and for Lot B at about 8.5 lb.; or expressing it in terms of cereal for the benefit of the farmer, it may be said that Lot A ate a ration *equivalent* in food value to 49 lb. of maize-meal per week, while Lot B ate the equivalent of 47 lb. per week. The difference is small and both are obviously well above ordinary living requirements for animals of 800 lb. live-weight. There would, therefore, seem to be no escape from the conclusion that while Lot B maintained their weight constant over the period concerned, they actually ate food in considerable excess over maintenance needs, simply "combusting" the extra ration for *no useful purpose;* whereas Lot A, using roughly the same excess food, used it profitably for *carcass increase* at the rate of 1½ lb. per head per day.

Mere "structural" requirements of phosphorus, for skeletal and general tissue development, could hardly account for the magnitude of the difference involved, an increase of 210 lb., or 33 per cent. in sixteen weeks, a good deal of which is *fat.* It therefore appears highly likely that phosphorus plays a specific role in cellular metabolism; has indeed what might well be called a *vitamin* effect, which facilitates utlisation of carbohydrate and protein in general tissue anabolism. One need only compare the behaviour of these cattle with that of laboratory rats on a diet deficient in vitamin B, stunted growth rapidly becoming normal the moment the missing factor is supplied. And after all, *what is a vitamin?* It has been defined as something which is necessary for life and health, but which does *not necessarily* contribute either to the structural framework or dynamic requirements of an animal. Phosphorus happens to contribute very largely to the structural framework, but it would seem to have a function quite apart from its use as a "building stone"; a function highly reminiscent of that which is commonly associated with the conception of the term "vitamin." This point is now being worked up in some detail, but provisionally it is not unreasonable to assume that a "growth impetus" responding with a weight increase of 125 lb. in seven weeks (Fig. 15), after being held in abeyance for ten months (Fig. 14), predicates more than a mere structural use of phosphorus; predicates a *functional use in intermediary metabolism.* As providing an analogy for the "functional" as distinct from the "structural" utilisation of phosphorus compounds, one might refer interested readers to the recent American work of Meigs and Blatherwick. These authors adduce evidence to show that circulating "phosphatids" play an important part in the synthesis of caseinogen and fat in milk, quite irrespective of the personal requirements of the mammary gland itself. Why should phosphorus, in one form or another, not play an equally important part in the intermediary metabolism of protein and fat for all cells of the body, irrespective of their demands for phosphorus compounds as units in their framework?

But this is digression. The farmer is not interested in such speculation, and for him the lesson in Fig. 14 may be more simply stated:—*Cattle on a phosphorus deficient diet do not utilise their food economically. Even if they eat a lot they waste it, and do not give a profitable return in live-weight for it. If the deficiency is rectified by bone-meal feeding, they may eat more, but give a much better value in beef for all they eat.*

In passing it may be added that although the cattle of Fig. 14 did actually eat very much the same in terms of "calories" (energy, or heat, or, broadly, "food") during the last period of the experiment, it by no means follows that they would have done so under ordinary conditions of veld grazing. After all, even when without bone-meal they were "coaxed" by the fixed ration of fanko—*i.e.,* much food in small bulk. After polishing off the 4 lb. of this flaked maize, they presumably

proceeded to fill their bellies comfortably with hay. If they had been dependent solely upon sparsely distributed poor grass, it is highly probable that the failing appetite of the phosphorus deficient batch would then have stopped short at consuming the bare amount required for mere maintenance. The fact still remains, however, that in this experiment, whether coaxed or not, they did actually eat more than required for maintenance; and did to all appearances digest all their food; and did, therefore, waste the excess quite literally in *gas* (carbon dioxide through the lungs), instead of utilising it, as did the phosphorus efficient batch, to form carcass increase.

VI. METHODS OF BONE-MEAL FEEDING.

Presuming that readers are now convinced of the advantages of feeding bone-meal, the present stage is perhaps suitable for indicating the methods generally adopted. Each farmer must be guided by his own experience in handling his own stock under the varying conditions of his own farm, but the following methods will be found serviceable:—

(1) *Along with other food.*—If supplementary rations are fed, as in the case of dairy cows and high-class stock, the simplest way is to mix the bone-meal ration with the concentrates. This method can easily be adjusted to individual cases—*e.g.*, the giving of most bone-meal to the heaviest milkers.

Fig. 16.

(2) *In troughs.*—The best way is to use a large number of small, cheap wooden troughs, so that each animal gets its share, and so that stronger animals cannot rob weaker animals. The simplest device is to construct kraals at the watering-places and pass the animals through these on their way to or from water. If twenty animals are passed through at a time, and twenty-one or twenty-two troughs supplied, each animal will immediately secure its ration and pass on. Another dose of bone-meal can then be emptied into each trough by a single operator, and the next lot of cattle passed through. The animals very soon learn what the troughs are for, and make straight for their bone-meal, so that no time is wasted. A few licks suffice to finish the ration of a few oz., and if the troughs are properly spaced, even the weaker animals manage to gulp down their allowance before stronger animals can rob them. Fig. 16 illustrates the method as originally practised at Armoedsvlakte.

Instead of using troughs, some farmers find it sufficient to place the ration in little heaps on the ground. The animals can be educated to run to the same spot each day.

(3) *By the "crush" method.*—In place of small troughs, it is often simpler to construct a long "crush"—*i.e.*, a double fence similar to that used as approach to dipping tanks. If the crush is just wide enough to allow animals through in single file, and is placed at the entry or exit of a kraal surrounding the watering-place, it becomes a very simple matter to dose each animal as it passes through. The animals

like the bone-meal, and dosing is very simple. Fig. 17 illustrates one of the crushes used at Armoedsvlakte.

FIG. 17.

After a little experience the cattle get to know their job and actually put their heads over the side of the crush in anticipation of the bone-meal, as shown in Fig. 18.

If large spoons, or cigarette tins marked off in "oz. of bone-meal" are used, the dose can be varied according to the individual animal, and maximum economy effected. As an old ox comes along, he gets 1 oz., or even 3 oz., if he is known as a bad craver; a growing steer or heifer is easily supplied with 2 oz.; a lactating cow with 5 oz.; and so forth, according to the experience of the stockmen. By this method, it is possible for one expert white man, with a native assistant and a "piccanin" to hold the bone-meal bucket to dose up to 200 animals an hour. Fig. 19 illustrates the method, as practised at Armoedsvlakte.

It is best to damp the bone-meal, or work it into a porridge with water, in order to prevent blowing about by wind. For the porridge form, a large tablespoon is useful. A few trials give the number of ounces per spoonful. The native assistant holds a

FIG. 18.

horn and pulls the tongue aside, while the white man wipes off the dose on the back of the tongue. The animal blinks contentedly and passes on as if given a sweetmeat. This method is the ideal one for a rancher who has to handle thousands of cattle round relatively few watering places. If the camping system is such that only one native herd-boy is available for one batch of animals, the system has to be modified to suit requirements; as, for instance, by placing the ration in a trough at the end of the crush and giving each animal time to finish its allowance before passing out. The point to be emphasised is that cattle *like* bone-meal and can be readily trained to take it by any system of dosing. Bone-meal "biscuits" are worth a trial in some cases.

(4) *As a lick.*—This is perhaps the easiest method, but it is the one most wasteful of bone-meal, since some animals will consume very large quantities if they have free access. There is one gourmand in the Armoedsvlakte herd who regularly helps himself to over 4 lb. of bone-meal at a session, when allowed unlimited access. It is quite a serviceable method, however, when the farmer does not mind using a large amount of bone-meal and treats all excess consumption as fertilising his pasture. If this method is used, it is still advisable to use a fairly large number of troughs, and it is essential to keep them constantly replenished, so that the weakest animals always get enough.

In general, it is advisable to give bone-meal as such, and not mixed with salt, the salt ration being given in separate troughs in the usual way. Many farmers prefer to mix the bone-meal and salt together as one lick, but since the craving for the two

Fig. 19.

does not run parallel, and some cattle will adjust the amount they eat to their taste for salt, there is always the risk of their getting too little bone-meal. By keeping the bone-meal separate the amount supplied can be varied according to experience of the needs of the stock on any particular farm. If, however, the farmer still prefers to mix as one lick, the proportion should generally be two of bone-meal to one of salt, and never less than one of bone-meal to one of salt.

Frequency of Feeding.—Wherever possible the attempt should be made to feed the bone-meal every day except Sundays. If this is impossible, administration on alternate days—*i.e.*, three times a week, may be adopted. Feeding at longer intervals is of much less value and often does very little good at all. The reason for this is that the animal cannot store phosphate to any great extent, and that large doses at long intervals are not properly digested, but pass out in the dung. Hence every effort should be made to give the ration *at least* three times a week, and preferably oftener. Experiments have been carried out at varying intervals of feeding, and although the results are not charted here, it may be emphasised that it was found practically impossible to prevent osteophagia by feeding once a week, however much bone-meal was then given; and that even bi-weekly feeding proved wasteful and ineffective. At Armoedsvlakte, feeding, generally "dosing by the crush method," is

conducted as a *daily routine*, Sundays being omitted in order to give the stockmen the usual day of rest. The question of feeding phosphorus compounds other than bone-meal is discussed under Fig. 24 below.

VII. DEFICIENCY OF PHOSPHORUS IN THE VEGETATION.

As mentioned earlier, the logical order of discussing Fig. 1 might well have been taken from mother earth as starting point; thence through the vegetation, and thence on to the effect upon the animals eating that vegetation. The order of interest to the stock farmer, however, is probably that actually adopted, taking first the effect of phosphorus deficiency upon the animal and leaving the less interesting considerations of soil composition to the end. There remain, therefore, the data upon phosphorus deficiency in vegetation and soil to be linked up to the defective nutrition of the animal.

Going back to Fig. 1, the following analyses of mixed grasses cut from the Armoedsvlakte veld at different times of the year are of interest. A considerable proportion of the total vegetation consists of bushes and of plants rarely eaten by stock, but since the main food of the grazing cattle is derived from the grasses, only the analyses of these need be considered:—

Proximate Analyses of Dry Matter of Armoedsvlakte Mixed Grasses.

Date.	Crude Protein.	Ether Extract.	N-Free Extractives.	Crude Fibre.	*Ash.	P_2O_5.	*CaO.	Estimated energy value. Starch = 100.	Ratio of Starch equivalent to P_2O_5.
	%	%	%	%	%	%	%		
10th Nov., 1919 ..	19·4	5·5	41·0	22·5	11·6	·60	·31	56	100:1·07
8th Dec., ,, ..	14·3	5·6	46·8	25·6	7·7	·32	·59		
15th Jan., 1920 ..	13·8	5·5	48·0	25·0	7·7	·22	·50	52	100:0·42
4th Mar., ,, ..	7·2	3·4	49·8	33·7	5·9	·24	·43		
19th April, ,, ..	4·9	2·4	51·6	35·0	6·1	·11	·46	32	100:0·33
11th May, ,, ..	4·1	2·2	52·9	34·9	5·9	·07	·50		
8th June, ,, ..	4·0	2·0	53 7	33·1	7·2	·09	·59	25	100:0·36
European figures for comparison.									
Rich pasture grass	20·5	4·6	45·9	19·0	10·0	·7	·9	60	100:1·16
Poor meadow hay	8·7	1·7	44·8	39·0	5·8	·4	·9	22	100:1·81

* Figures for Ash and CaO variable owing to contamination with dolomitic dust.

The data are expressed upon the *dry matter* of the plant—*i.e.*, after removing the moisture in a warm oven, in order to simplify comparison of feeding value and of phosphorus content.

The very young green grass of early spring (October to November), it will be noted, is highly nutritious and has a fairly high phosphorus content, but after the seed has fallen (April to May) the general feeding value, or "energy value," is reduced to less than half, and then approximates that of a poor European hay. The most striking feature, however, is the extraordinary low phosphorus content, averaging about .08 per cent. P_2O_5 or only one-fifth of that present in ordinary European hays. As the grass matures, carbohydrate formation in the plant proceeds so much faster than phosphorus absorption from the soil that the percentage of phosphoric oxide rapidly falls. The osteophagia, or craving for bones, illustrated in Fig. 2, is directly attributable to this; and the feeding of any suitable phosphorus compound rectifies the deficiency in such a way as to effect the miraculous improvement in growth and condition illustrated in Fig. 7, so long as there is grass enough to ensure a "full belly." In spite of the low general nutritive value of the winter grazing, the cattle can, provided there is *enough of it*, generally get through the winter without serious loss of weight, as shown by the lower curve of Fig. 8. Owing, however, to the fact

that the soil is poor and shallow, and the rainfall low and seasonal, the grass covering of the veld is scanty. The vegetation grows in tufts surrounded by bare soil, and its "shade area" is considerably less than one-fifth of the total soil area. Fig. 20 gives

Fig. 20.—Armoedsvlakte Veld, 19th March, 1917.
Aristida congesta, with *Grewia incana*.

an impression of the Armoedsvlakte veld calculated to depress any European observer. Fig. 21 shows cattle grazing over what is for Armoedsvlakte a good supply of grass.

Fig. 21.—Armoedsvlakte, 19th March, 1917. Green. Luxuriant.
Aristida and *Eragrostis* veld, with *Grewia incana* and *Tarchonanthus camphoratus*.

The prevalence of bushes and the stony dolomitic soil are quite well shown. Fig. 22 shows a closer view of the food the cattle subsist upon and illustrates the tuft habit of growth with the bare soil patches between. All three photographs are from the collection of Dr. I. B. Pole Evans.

In a bad year, of subnormal rainfall, the available grazing during the dry winter may be so scanty that cattle have to expend much energy in roaming far from the watering-places (windmills and boreholes or wells) in search of food. Under such conditions the balance between energy derived from the poor quality grass, and energy expended in getting it, may be a negative one; so that loss in condition amounting

to 15 per cent. of body weight during the winter is by no means uncommon amongst the herds of Bechuanaland farms. This "quality factor" is clearly brought out in Figs. 5 and 6. As mentioned under Fig. 5, a mixed herd may easily drop from 800 lb. per head to 700 lb. per head during the rainless winter months. If the rains are delayed much beyond the usual date, pronounced starvation, and even death from "poverty," is not uncommon. In areas of higher or more evenly distributed rainfall the "quantity factor" of the grazing is more constant, and in such cases phosphorus deficiency of the grass may be the sole limiting factor in growth and condition of stock. Such areas are not uncommon over well-watered but heavily-leached soils in Natal.

In regard to the phosphorus deficiency shown in the foregoing table, it must be remembered that interpretation of analyses cannot be made merely from the "percentage P_2O_5"; but that the general feeding value of the vegetation must be considered at the same time. Since even the phosphorus of fully ripe hay is moderately well utilised by cattle, the ratio of "starch equivalent" to "phosphoric oxide" forms a better guide to phosphorus deficiency than the actual percentage of phosphoric oxide itself.* Broadly speaking, the naturally grazing animal adjusts its food intake to its requirements for energy purposes and, as the grass deteriorates in value, does its best to make up for poor quality by eating increased quantity. With increased quantity of grass comes increased total phosphorus, so that a low "percentage P_2O_5" on a grass of low "fuel value" is much the same as a higher percentage in a better quality grass. This mode of expression "S.E.: P_2O_5" is adopted in the last column of the table of analyses, and renders it easy to realise that,

Fig. 22.—Armoedsvlakte, 4th May, 1916. Veld Green. Grasses in Flower. A fairly good year.

except for the period of young shooting spring grass, the Armoedsvlakte veld is *deficient all the year round.* The very young grass of early November has a ratio figure of 1.07 P_2O_5 per 100 Starch Equivalent, not far below that of European pasture; but the rapidly-growing green grass of January, still highly nutritious and containing 13.8 per cent. of protein, is already down to 0.42 "energy-phosphorus ratio"—a figure well below the phosphorus requirements of the animal, and therefore productive of osteophagia and stunted growth. Without definitely asserting a minimum phosphorus figure for normal nutrition of cattle, the ratio 100: 0.8 may be indicated as probably fairly near the truth. Such a figure would at any rate explain why phosphorus deficiency is practically unknown in Europe, and yet prevalent over an enormous acreage of South Africa.

* NOTE.—"Starch Equivalent" is, of course, simply the number of lb. of starch which is equal, as a source of energy, to 100 lb. of the food considered, and therefore forms a convenient measure for comparing different foods. Maize or oats could just as well be used as standard for comparison, but since such materials vary in composition and the staple cereal varies in different countries, it is better to take a pure compound like starch or sugar as unit. A still better unit is the "Calorie," the physical unit of heat, but the term "starch equivalent" is perhaps more easily understood by the South African farmer. "Phosphoric Oxide," P_2O_5 is, of course, the common expression used in comparing the amounts of phosphorus in different manures under the Fertilisers Act, and being familiar to the farmer is used here.

Seasonal Variation of Phosphorus Deficiency in the Grass as reflected by Osteophagia in the Cattle.—As just mentioned, the very young grass of early spring does, for a short period, contain sufficient phosphorus for normal nutrition. The period, however, is very short, and in general the cattle do not secure sufficient of this very young grass to benefit in any striking way. The practice of the country, wasteful, but nevertheless necessary in regions of cheap uncultivatable land, is to destroy the old standing grass of the preceding year by *burning* the veld. Part is left unburned to provide food remnants until the rains bring on the young green vegetation over the "burns," and the cattle are then transferred to the "burned veld." The new season's growth of "unburned veld" is therefore admixed with old grass of the preceding year. For the brief period of very young phosphorus-rich Spring growth, the extent to which the cattle receive an adequate "phosphorus intake" depends upon the proportion of new to old grass—*i.e.*, partly upon the proportion of burned to unburned veld. By the time the green grass over the burns is really abundant, most of it has reached the stage at which the percentage of phosphorus is rapidly diminishing. In practice, therefore, it usually works out that the veld is really *phosphorus deficient the whole year round*, but is not quite so bad in spring. Fig. 23 illustrates this, a chart correlating rainfall, phosphorus content of the vegetation, and extent of osteophagia, over the years 1919 and 1920. Osteophagia is here, as in Fig. 12, utilised as clinical symptom reflecting phosphorus deficiency in the animal.

In reading this chart it may be explained that rainfall is recorded as weekly totals on the scale indicated; phosphorus in the dry matter of the grass (dotted line) by weekly or fortnightly analysis of samples cut from a small paddock reserved for the purpose; osteophagia tested weekly by the method already described, and charted as percentage of the herd which showed craving for "rotten bones." The sequence of events is easily read from the curves. When the observations commenced in August, 1919, the veld showed so little green growth that grazing was confined to the old standing grass of ·08 per cent. P_2O_5 content. At this time 75 per cent. of the herd, recently introduced on the farm, showed osteophagia. Over the next two months the proportion of young green vegetation increased sufficiently to supplement the old grass appreciably, and there is a slow reduction in the extent of osteophagia, down to 50 per cent. During October slight rains fell, too small to be recorded separately on the chart, and therefore recorded as total for October. These were sufficient to bring on the new green grass of the *burned veld* to the point at which the cattle could subsist very largely upon it. As the dotted line shows, this young grass contained 0·6 per cent. P_2O_5 (expressed on the *dry matter*) and the response of the cattle was immediate. In four weeks the osteophagia had practically vanished. On 1st November heavy rain fell, nearly three-quarters of an inch, followed by lighter rains during the following week, but by almost complete drought and blazing sun for the ensuing six weeks. The effect of this was initial rapidly falling phosphorus-content, followed by partial wilting. Osteophagia promptly returned. The heavy subsequent rains of January and February effected only a slight transient reduction of osteophagia, since during this period the grass was growing rapidly, and its average phosphorus-content fluctuating towards the lower percentage characteristic of older plants. It is interesting to note, however, that further stimulation of very young growth by the later rains, did effect slight increase of phosphorus in the "average pasture," accompanied by slight reduction of osteophagia in February. Thereafter the phosphorus content of the grass fell steadily, and the extent of osteophagia remained consistently high for the rest of the year; right up to the following July and August when the deeper rooted vegetation (edible bushes) again began to show incipient green growth. In this year (1920), the herd, for various reasons, had to subsist upon *unburned veld*, *i.e.*, a mixture of the new season's growth with material qualities of old standing grass of the previous year. The *average* phosphorus-content of the total vegetation of course increased with the new season's gorwth, but owing to dilution with the old grass never exceeded 0·25 per cent. P_2O_5. Accompanying the rise to this figure came a corresponding fall in the extent of osteophagia to about 35 per cent.; chiefly manifested by the oxen and older growing stock and not at all by cows with suckling calves.

The two curves for the whole period of two years thus show:—

(*a*) That the extent of osteophagia in cattle varies *inversely* as the proportion of phosphorus in the grazing.

(*b*) That phosphorus deficiency is manifested the whole year round, but is least acute during early spring, and may indeed almost disappear for a very short time if sufficient of the very youngest new growth becomes available for the stock.

The last proviso is, however, rarely fulfilled in practice. A farm is usually stocked according to its "carrying capacity per morgen" averaged over winter and summer. Hence at the period of incipient green growth of high phosphorus content,

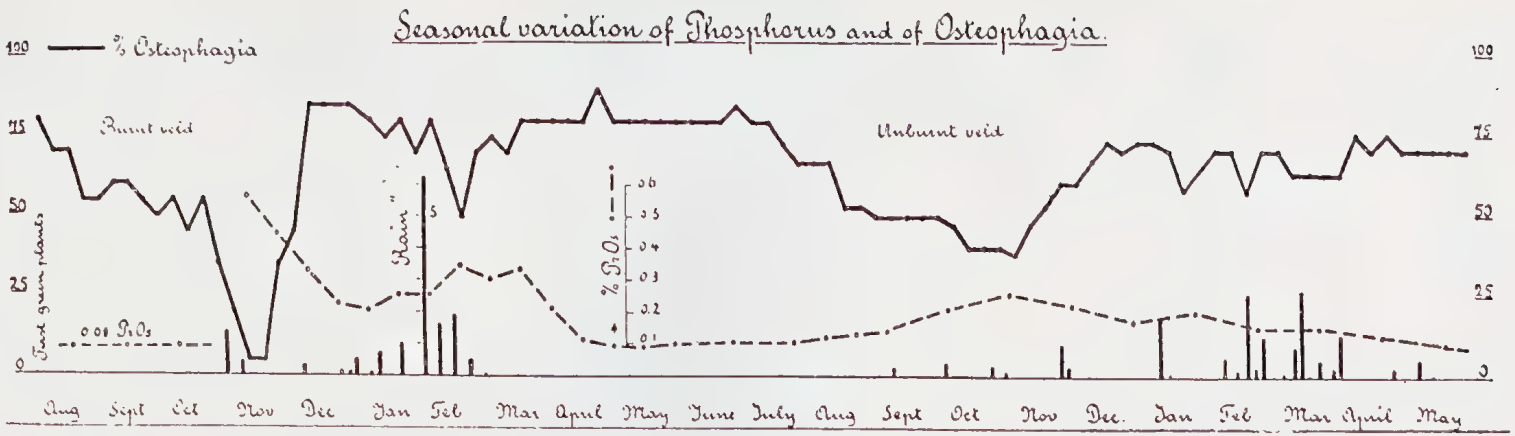

Seasonal variation of Phosphorus and of Osteophagia.
% Osteophagia
Burnt veld
Unburnt veld
Rain
% P2O5
Aug Sept Oct Nov Dec Jan Feb Mar April May June July Aug Sept Oct Nov Dec. Jan Feb Mar April May

FIG. 23.

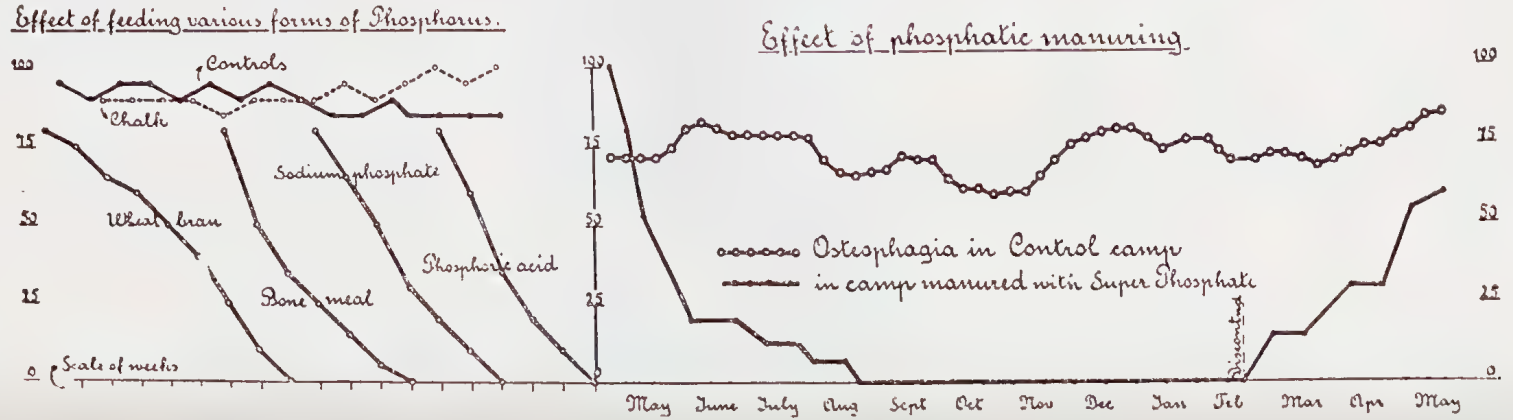

Effect of feeding various forms of Phosphorus.
Controls
Chalk
Sodium phosphate
Wheat bran
Phosphoric acid
Bone meal
Scale of weeks
Effect of phosphatic manuring.
Osteophagia in Control camp
in camp manured with Super Phosphate
Discontinued
May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May

FIG. 24.

the new vegetation is not yet capable of supporting all the cattle. As the new grass develops to the point of supporting the whole herd, independently of the old grass of the preceding year, it also diminishes in phosphorus content. The broad result therefore is that the cattle suffer from phosphorus deficiency all the year round; and continuous bone-meal feeding, varying somewhat with the season if desired, is therefore recommended.

Effect of feeding Various Forms of Phosphorus.—The next chart, Fig. 24, shows the effect upon osteophagia of supplementing the deficient vegetation, either directly through the mouth by feeding various phosphorus compounds, or indirectly by phosphatic manuring of the pasture.

The curves on the left show the rapid reduction of osteophagia produced by feeding four representative phosphorus compounds; wheat bran supplying phosphorus in organic form associated with relatively little other mineral matter; bone-meal supplying it in the form of calcium phosphate; sodium phosphate supplying it combined with another base; phosphoric acid eliminating the base altogether, and thus pinning down the deficiency quite definitely to phosphorus and to nothing else. It may be added that phosphoric acid is *not* a good form of phosphorus for practical use since, being a "fixed acid," it tends to disturb the base-acid equilibrium of the body. The best and *cheapest* form is bone-meal, which has the added advantage of being *palatable*, of satisfying the specific craving, and of offering least trouble in administration. Many other, including ground rock phosphate, have been tried, but have either proved too costly or too difficult of digestion, and in some cases (superphosphate) productive of digestive disturbance. Ground mineral phosphates are cheaper, but so much less effective that they cannot compete with bone-meal. *Precipitated* calcium phosphate behaves very like bone-meal, but it more expensive, tasteless, and more troublesome to administer; especially since the cattle do not "recognise it" and do not take it of their own accord. Bran is of course excellent but expensive. The phosphorus contained in bran and in bone-meal can be treated as about equally available in digestion, and the two sources therefore evaluated on the basis of their phosphorus content; 1 oz. of bone-meal being as useful in rectifying phosphorus deficiency as about 1 lb. of average South African wheaten bran. Owing to the high cost of bran "per unit of phosphorus," it only comes into consideration in practice when a definite value is placed upon it as an ordinary supplementary feed in a mixed ration, *e.g.*, for dairy cows.

For cattle reared under South African ranching conditions, and expected to earn their living exclusively on the veld, bone-meal is always recommended. The quantities to feed have already been dealt with, but in connection with Fig. 24 it may be added that the *time* taken to remove osteophagia is usually six to eight weeks when 3 oz. per head per day are used for oxen or growing stock, and 6 oz. for cows. This time can be further reduced to about three weeks by feeding large amounts such as 1 lb. per day. It is a good plan to start off on this liberal scale whenever it is desired to cut short an outbreak of lamsiekte. As soon as the osteophagia is reduced, it of course pays to drop down to the smallest amounts which hold the craving in check and give satisfactory returns in beef production.

From the two upper curves on the left of Fig. 24 it will be seen that the control cattle and the cattle receiving *chalk* maintained their high craving throughout the whole period during which the phosphorus-fed cattle rapidly lost osteophagia. Indeed, during the latter part of the period the chalk-fed animals actually showed increased osteophagia, thus contradicting the practice of some farmers of mixing lime with bone-meal. There is no deficiency of lime in the Armoedsvlakte vegetation, and added lime probably decreases the availability of food phosphorus during digestion. Moreover, all sorts of other compounds have been tried—Epsom salts, Glauber's salts, iron sulphate, sulphur, and a variety of others. So long as phosphorus is absent nothing is gained, and osteophagia does not disappear until a phosphorus compound in digestible form is supplied. "Abnormal craving," or "pica," or "osteophagia" in the cattle of these areas is definitely due to phosphorus deficiency and not to deficiency of anything else. The farmer should entertain no illusions about this and should leave "proprietary licks" alone, in favour of the much cheaper and more effective bone-meal.

Effect of Phosphatic Manuring.—The curves on the right of Fig. 24 show that the same results can be obtained by *manuring* the pasture with available phosphate. In the experiments here recorded, superphosphate was applied at the high rate of 500 lb. per acre just after the October rains in 1919. In May, 1920, the manured camp was tested against an unmanured control camp by introducing craving cattle. By this time the new grass of the former contained over three times as much phosphorus as similar grass from the latter, and as the chart (Fig. 24) shows, the cattle in the unmanured camp retained their high "craving for bones," while those in the manured camp rapidly lost all sign of it. The moment the latter were transferred back to the unmanured camp at the end of February, 1921, the osteophagia began to return and in a few months was as bad as ever.

This experiment is theoretical rather than practical in so far as the majority of ranching farms is concerned. With land at 10s. to 30s. per morgen (about 2 acres), as it is around Armoedsvlakte, and with a shallow soil, and low rainfall strictly limited in its seasonal incidence, phosphatic manuring does not pay; costs more than the capital value of the land. The stock-carrying capacity of Armoedsvlakte is reckoned at about "9 morgen per beast," a ten thousand morgen farm being capable of supporting rather over a thousand cattle. Seven shillings per annum spent in getting bone-meal down the throat of an animal is a highly profitable proceeding, bringing in, as shown earlier, several hundred per cent. profit as increased live-weight. The same sum scattered over 9 morgen of land with, say, superphosphate at £4 per ton, would make practically no impression on the phosphorus content of the vegetation. On the other hand, at least 80 per cent. of the bone-meal fed to an animal ultimately passes out again in the excreta, after the animal has had the use of it; and remains on the farm, manuring the veld, slowly increasing its carrying capacity for vegetation and stock, and slowly increasing the phosphorus content of the pasture.

In arid areas of cheap land, therefore, the proper thing to do is obviously to base the *primary return* for cash outlay upon the *saleable animal;* and treat the secondary manurial return as a consolation in store for posterity. In areas where rainfall is heavier and more evenly distributed throughout the year, the soil arable and deeper, the land nearer the big industrial centres or seaports and correspondingly more valuable, direct phosphatic manuring pays. Even then, it pays primarily as an arable proposition and it is still preferable to pass the phosphorus needed by the animal *through the animal first,* using the phosphorus-rich dung for fertilising the soil. As expressed in Fig. 1, the whole chain of disaster can be broken by manuring the soil, but it is cheaper to break it by feeding bone-meal, *incidentally* effecting phosphatic manuring.

VIII. SOIL DEFICIENCIES.

To return now to the starting point of all the trouble, the following soil analyses are of illustrative interest when considered in the light of the results of feeding phosphorus to animals reared upon it. Technical discussion of several soils of lamsiekte and styfsiekte areas will be found in the forthcoming "Reports of the Director of Veterinary Education and Research." At this juncture only a few points of major interest need be noted.

The soil of Armoedsvlakte is shallow, varying from dolomitic outcrop to a few feet of leached soil. According to the extent of leaching it varies from a heavy dolomitic loam to a sandy soil containing very little carbonate, although still *alkaline.* The following chemical and mechanical analyses, kindly undertaken by Dr. Marchand, of the Division of Chemistry, illustrate this:—

Lamsiekte Soil. Armoedsvlakte, Vryburg.
Modified Rothamsted Methods.

Chemical Analysis.	Dolomitic Areas. Per Cent.	Leached Areas. Per Cent.
Moisture	6·88	0·77
Loss on ignition	27·47	2·58
Insoluble matter (HCl)	31·07	90·18
Iron oxide and Alumina	1·56	6·10
Lime	12·07	0·16
Magnesia	21·34	0·12
Total potash	0·11	0·42
Total phosphoric oxide	0·12	0·03
Available potash	0·016	0·011
Available phosphoric oxide	0·001	0·0005
Nitrogen	0·24	0·08
CO_2 expressed as $CaCO_3$	45·0	0·12
Mechanical Analysis.		
Fine gravel	0·12	4·82
Sand	5·30	30·66
Fine sand	19·19	48·82
Silt	10·83	1·95
Fine silt	8·52	1·91
Very fine silt	6·00	1·61
Clay	7·47	7·15

The next two soils are from styfsiekte farms, *Lidgetton* near Maritzburg, Natal, and *Athole* on the High Veld, in the Ermelo District. Both are leached *acid* soils (to litmus paper), from more hilly country of higher rainfall. They are deeper and contain practically no carbonate.

Styfsiekte Soils.

	Lidgetton, Natal. Heavy Loam. Per Cent.	Athole, Ermelo. Medium Grey Loam. Per Cent.
Moisture	5·46	2·79
Loss on ignition	15·46	6·87
Insoluble matter (HCl)	54·24	72·83
Iron oxide and Alumina	23·54	16·70
Lime	0·08	0·05
Magnesia	0·43	0·05
Total potash	0·73	0·03
Total phosphoric oxide	0·09	0·06
Available potash	0·02	0·004
Available phosphoric oxide	0·001	0·001
Nitrogen	0·31	0·11
CO_2 expressed as $CaCO_3$	Less than 0·01	Less than 0·01

The very low "available phosphoric oxide," ·001 per cent. or less, is the feature to which it is desired to draw special attention in all three soils. So far as present investigations go, all lamsiekte and styfsiekte soils have this feature in common; and as already shown, the low available phosphorus is reflected in the later stages of growth of all grasses (irrespective of botanical species) grown upon them.

A farm, "Verona East," for which, however, a complete analysis is not available at the moment, is of special interest as being in the Vryburg District not very far from Armoedsvlakte, but as showing two large areas differing widely in "available

Fig. 25.—A Armoedsvlakte soil without manure; A' with full manure.
S Shepstone " " " S' " " "
V Verona East " " " V' " " "

phosphoric oxide.' One of these areas is a grey granular stiff loam containing ·009 per cent. available P_2O_5, and the other a brown granular loan containing ·0027 per cent.; both exceedingly low in chalk. Osteophagia, occasionally leading to lamsiekte, occurs on the latter, but is not nearly so marked as at Armoedsvlakte. On the other area, so-called "Ganna veld," of higher phosphoric oxide, lamsiekte never occurs. If an outbreak occurs on the phosphorus-low soil it promptly fades out on transferring the cattle to the soil richer in phosphorus. The vegetation growing on these two areas of the same farm reflect the proportion of phosphorus in the soil; the same botanical species of grass showing a relatively low phosphorus-content on one and a relatively high phosphorus-content on the other.

The soil analyses shown in the foregoing tables make dreary reading in an article designed to be attractive to the farmer, and may therefore be enlivened with a few photographs representing a preliminary study of selected soils in *pot experiments*. These experiments belong to a series conducted by Dr. Van Zyl (of this laboratory) and will appear in detail in forthcoming "Reports of the Director of Veterinary Education and Research." Fig. 25, on the preceding page, offers a comparison of the lamsiekte soil of *Armoedsvlakte*, Vryburg (·001 per cent. available P_2O_5), the styfsiekte soil of *Shepstone*, Ermelo (·0015 per cent. available P_2O_5), and the Ganna veld soil of *Verona East* (·009 per cent. available P_2O_5), just referred to as free from both diseases. The comparison is between cuttings of barley grown in pots on the three soils, manured and unmanured, with liberal water supply (80 per cent. W.H.C.) in all cases.

It will be seen that sheaf V is almost as abundant as sheaf V', *i.e.*, that the Verona soil is fertile and benefits relatively little by manuring. Sheaves A' and S' are very much superior to A and S respectively, *i.e.*, Armoedsvlakte and Shepstone soils respond very readily to manuring, by increase of crop.

That the response to manuring is primarily a response to *phosphorus* is next shown for the Armoedsvlakte soil, in Fig. 26, illustrating the early stages of growth in the pots:—

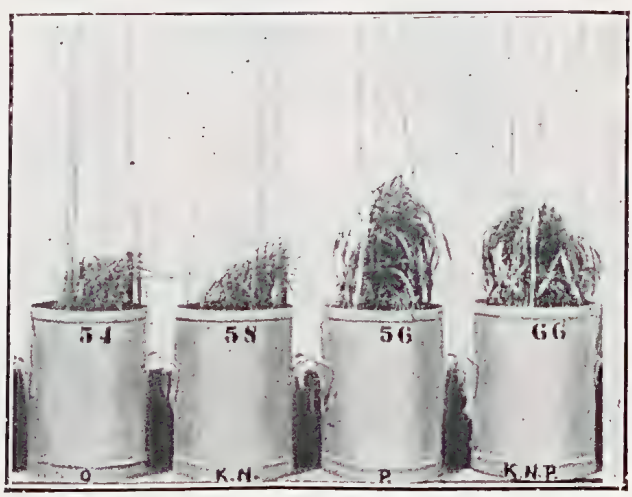


FIG. 26.

Pot 54 is the control receiving no manure. Pot 58 received potash (K) and nitrogen (N), and shows no improvement. Pot 56 received phosphorus (P) alone and responded at once, as shown by the much denser foliage. Pot 66 received nitrogen and potash as well as phosphorus, but is much the same as pot 56 receiving phosphorus alone, thus indicating that, apart from water supply, phosphorus is the main limiting factor in plant growth on the Armoedsvlakte soil.

In the case of *Shepstone* the soil is acid and responds to lime as well as to phosphate, as illustrated in Fig. 27.

Here it will be seen that sheaf 4 receiving lime (Ca) alone is better than sheaf 3 receiving no manure at all; and as good as sheaf 5 which receives potash and nitrogen in addition to lime. The fact that sheaf 6 receiving phosphorus and lime is as good as sheaf 7 receiving nitrogen and potash as well, indicates that the response to nitrogen (N) and potash (K) is not marked; while the great superiority of both over sheaves 3 and 4 shows quite clearly that phosphorus is again the main deficient constituent.

The influence of *water supply* is brought out by the next two photographs. Fig. 28 compares the early stage of growth of barley in pots containing the same three soils maintained under drier conditions (40 per cent. W.H.C.). Fig. 29 represents the crops cut from the same pots at an intermediate stage of growth.

It is at once apparent that when water is the "limiting factor," growth is best on the Armoedsvlakte soil and worst on the Shepstone soil, both when measured

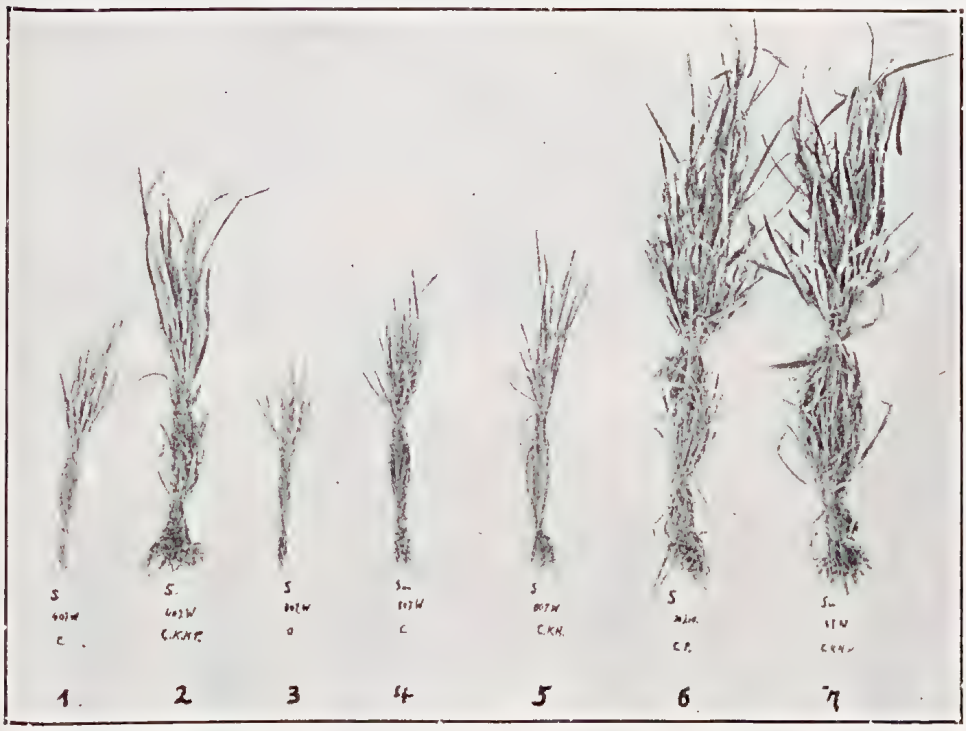


FIG. 27.—1 Lime alone
2 Lime, Potash, Nitrogen, Phosphorus } Low water supply.
3 Unmanured
4 Lime alone
5 Lime, Potash, Nitrogen
6 Lime, Phosphorus } High water supply.
7 Lime, Potash, Nitrogen, Phosphorus

(Nos. 60, 94, and 30) and when left unmanured (Nos. 47, 76, and 18). The Verona soil (No. 18) is more sensitive to drought and shows up no better than the Armoedsvlakte soil (No. 47) under restricted water supply, although, as Fig. 25 showed, it is much superior when water supply is abundant. Comparison of sheaf 60 with sheaf 30 in Fig. 29 shows that *manured* Armoedsvlakte soil is superior to manured Verona soil, when the water supply is restricted; although, as Fig. 25 showed (A′ and V′), much the same under abundant water supply and much inferior (A and V) when not manured.

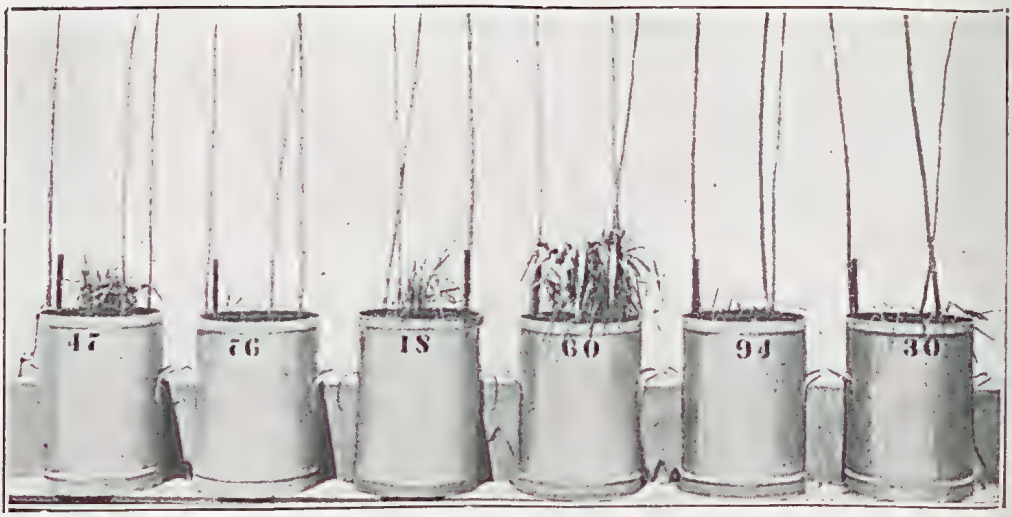


FIG. 28.—Pot 47, Armoedsvlakte, no manure; Pot 60, same, full manure.
Pot 76, Shepstone, " " Pot 94, " " "
Pot 18, Verona, " " Pot 30, " " "
All six pots *restricted* in regard to water supply. Early stage about six weeks old.

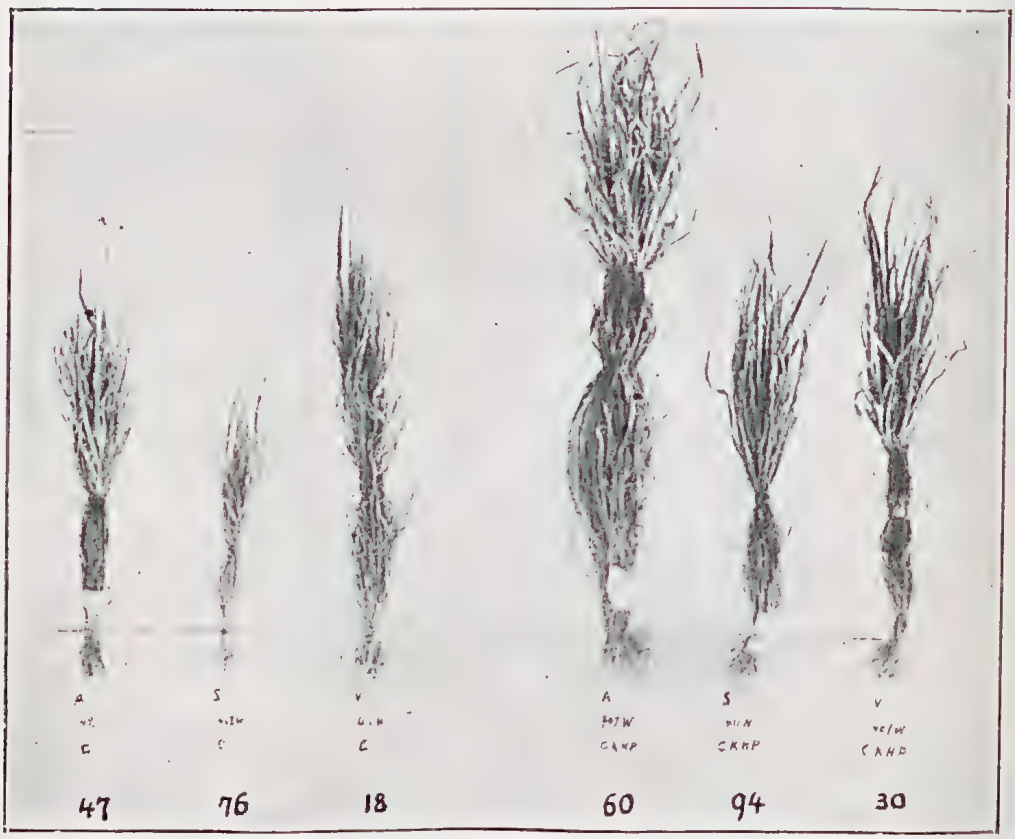


FIG. 29.—Same as Fig. 28. Barley three months old.
Crops cut from pots at intermediate green stage of growth and tied into sheaves for comparison.

Without entering into further details of the pot experiments which still have to be confirmed by *plot* (tenth acre) experiments *in situ*, it may merely be added that with the Verona soil rainfall is the main limiting factor in fertility, and that from the point of view of "plant food" it is not seriously deficient. The Armoedsvlakte soil is still subject to the limitations of rainfall, but withstands drought better wherever the depth is reasonable. With good rains, however, the second limiting factor of phosphorus deficiency enters, and although in a drought year Verona may be no better than Armoedsvlakte, the latter is far behind the former in a wet year. Unfortunately, the rainfall of the district is so unreliable and so seasonal in incidence that water supply tends to be the limiting factor in both cases, and the difference in "cattle grazed per morgen" is not so great as would be expected from the difference in fertility between the two soils. The most striking difference lies in the stunted growth of stock, and prevalence of lamsiekte, on farms of the Armoedsvlakte type, as compared with the freedom from disease and superior individual condition on farms of the Verona type.

FIG. 30.

The Shepstone soil has triple limitations; sensitiveness to drought, deficiency of phosphorus, and deficiency of lime. Fortunately, it is in an area of much higher rainfall than Armoedsvlakte, and stock raising is still possible; better for sheep than for cattle. In fact the owner had practically abandoned cattle rearing altogether in favour of sheep, owing to the prevalence of styfsiekte, until the discovery was made that bone-meal feeding would prevent that disease and permit of normal growth. The photograph above, Fig. 30, brings our story back to its starting point by showing two Shepstone animals of the same age, one fed on bone-meal and the other not, for the year preceding the taking of the photograph.

A year earlier these two animals were very similar in appearance. The one on the left now shows incipient styfsiekte and is in miserable condition. The one on the right has grown out during the year of bone-meal feeding, is in excellent condition, and quite free from the disease. Otherwise the two animals were treated in exactly the same way, running together in the same paddocks. It may be added that the one on the right had suffered from styfsiekte the year before, and was *cured* by bone-meal feeding.

The reference above, to the distinction between rearing of cattle and sheep on deficient veld, will form the subject of a later paper; suffice it to mention, that although both species of animal are susceptible to phosphorus deficiency, the feeding habits of sheep, and the "winter trekking" customs of farmers in areas such as Shepstone, render wool-growing possible even where beef production is unprofitable on the natural unsupplemented veld. It is hoped to present data upon bone-meal feeding of sheep on another occasion, since although sheep do not react to a phosphorus deficient veld in quite the same way as cattle, they do undoubtedly benefit by bone-meal feeding. They show osteophagia only in feeble fashion, hardly recognisable unless carefully observed, and therefore do not develop lamsiekte; nor, so far as is known, do they develop styfsiekte. Particularly for growth, however, a small ration of bone-meal is recommended—about half an ounce three times a week, or about two ounces a week given with an equal weight of salt in the form of a lick to which the sheep have frequent access.

IX. REVIEW SUMMARY.

(1) This article *"Phosphorus in the Live Stock Industry"* is a companion paper to the article *"Cause and Prevention of Lamsiekte"* which appeared in the June, 1920, issue of this *Journal*. Its profusion of illustrated matter in the shape of charts and photographs is so arranged as to interest the practical agriculturist as well as the veterinarian.

(2) The first diagram offers a graphic summary of the various effects of phosphorus deficiency in cattle, and shows that the diseases lamsiekte and styfsiekte are *indirect* consequences of phosphorus deficiency in soil and pasture, although other etiological factors subsequently enter: a toxin produced from dead organic matter by a saprophytic anaerobic bacillus being the *direct* cause in the case of lamsiekte.

(3) The indirect consequences, however, are of less economic importance than the direct consequences, since the latter concern the *nutrition* of the animal itself. Low phosphorus-content is a noteworthy feature of South African soils, and over wide areas of the Union the level of phosphorus reached in the natural vegetation is below the physiological optimum requirements of cattle.

(4) Charts and photographs conclusively demonstrate that in such areas phosphorus is a *limiting factor* in the *growth* of young stock, in the *condition* of older cattle, and in the *milk yield of cows*. Any digestible phosphorus compound, given as supplement to the natural grazing, rectifies the deficiency and permits of normal development. Phosphatic manuring of the soil has the same effect, but is impracticable in ranching areas worth only 5s. to 15s. an acre. Bone-meal feeding is the practical solution for ranching conditions. Bran is useful for dairy stock or high-grade animals receiving supplementary rations in the ordinary course of events. Rock phosphate is of little value and presents difficulties in administration.

(5) The demands for phosphorus are least for mere maintenance, intermediate for growth, and highest for milk production. The bone-meal ration therefore recommended for the districts investigated varies from ½ lb. per head per week for adult oxen and young calves, ¾ lb. for growing stock over 300 lb. in weight, up to 2 lb. or even more for lactating cows. This should be given in the form of daily portions (excluding Sundays), or at least tri-weekly. Bi-weekly or weekly feeding is wasteful and ineffective.

(6) On such a ration of bone-meal the rate of increase in weight during spring and summer is approximately twice that of unrationed controls. Expressed as percentage increase on initial live-weight, the gains are naturally most striking with young animals. One chart shows calves of 300 lb. live-weight that have increased in weight to about 470 lb. during the season on the natural grazing, and to about 640 lb. when supplied with bone-meal. The immediate effect upon growth is clearly brought out by photographs. Accompanying the superiority in weight, comes earlier maturity and superior quality of beef.

During the rainless winter the grazing is naturally poor and no headway is made by the stock. The phosphorus-fed cattle, however, maintain the advantage gained during spring and summer; and in some cases improve upon it in spite of the adverse conditions to which all stock are then subjected. Phosphorus feeding is shown to pay several hundred per cent. upon the outlay for bone-meal.

(7) The interesting phenomenon of "Osteophagia," a specific form of "Pica," is well illustrated, and its value as a symptom of phosphorus deficiency discussed.

(8) The methods adopted for routine feeding of bone-meal under practical ranching conditions are illustrated by photographs.

(9) An interesting experiment establishing the relationship between "phosphorus and food consumption" is discussed, and it is quite clearly shown that although animals receiving a bone-meal ration do eat more food in putting on additional weight, they also give a much better return "per unit of food consumed." When the phosphorus deficient controls were coaxed to eat more food than required for mere maintenance, they simply "combusted" the excess for no useful purpose. A *functional* as well as a *structural* rôle is predicated for phosphorus in cellular metabolism, and an analogy drawn with the "vitamins." Cattle artificially "stunted" in growth for about a year by dietary deficiency of phosphorus showed a growth rate almost above the normal on supplying the missing factor.

(10) Seasonal variation of phosphorus-content in the natural grazing is then discussed, data on chemical composition of the grasses being correlated with data derived by determining the amount of phosphorus required to prevent osteophagia in the cattle. As would be expected, the deficiency is least acute in the young grass and increases as the grass matures, the actual percentage phosphoric oxide of the dry winter vegetation being about .08 per cent. Broadly speaking, however, the grazing is below normal requirements of mixed stock all the year round. The ratio

"phosphorus content" to "energy value" serves as a rough guide in assessing deficiency by analytical methods. A few interesting veld photographs of the area studied are shown.

(11) A few analyses are presented, comparing soils from lamsiekte and styfsiekte farms with similar soils free from these diseases. Shortage of phosphorus, generally down to ·001 of "available phosphoric oxide," is the characteristic feature of the "deficient soils." Photographs of "pot experiments" enliven the analytical data, the crops obtained indicating phosphorus deficiency and low rainfall as the two main factors limiting the stock-carrying capacity of the Bechuanaland dolomitic district concerned; phosphorus alone, or phosphorus and lime, being the limiting factors in the well-watered but extensively leached soils of the Natal District and Ermelo High Veld.

Conclusion.

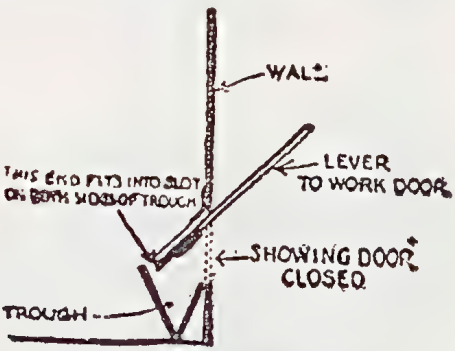
In concluding this article a broad recapitulation for the practical farmer is worthy of italics:—

In all areas where the soil and pasture are known to be deficient in phosphorus, it is profitable to feed bone-meal to practically all stock for the sake of improving condition and facilitating rapid growth. For cattle it is particularly advisable since two important diseases, lamsiekte and styfsiekte, can be prevented by liberal bone-meal feeding. When insurance against disease, increased beef production, increased milk yield, and more rapid growth of young cattle are all taken into consideration, it will be found that any expenditure on bone-meal is repaid many times over.

Acknowledgments.—It is a pleasure to render acknowledgment to Mr. D. T. Mitchell for supervision of the programme at Armoedsvlakte during 1920-21; to Dr. F. Veglia for like service in 1921-22; to Mr. Fourie in 1923; to Mr. Rodgers and Mr. Du Plessis for execution of detail at Armoedsvlakte, and to Mr. Marais for like work at Shepstone; to Mr. Richards, owner of Shepstone; and to Mr. T. Meyer for assistance with earlier experimental work and with charts and photographs.

MAKE PIG-FEEDING EASY.

Here is one of the greatest temper-savers a man can build. There is hardly a farmer living who has not wished that he could whale the life out of every pig in creation for climbing into the trough and making feeding or slopping practically



Make Pig-feeding Easy.

an impossibility. We all know only too well how many times pigs, through their crowding, are responsible for half of the swill going out of the trough.

The device consists simply of hinging a panel in front of the trough high enough above to permit it to swing in. The details in the sketch are sufficient to show how this is accomplished. The panel is hinged on the inside, and a lever is attached to swing it inward, and swill is poured into the trough from outside the pen. Notice that one side (the inside) of the trough is much higher than the other. This is not necessary, but is to the feeder's advantage. If too much space is allowed between the door after it is swung in and the inside of the trough, the pigs will get their snouts in the opening and make it practically impossible to close the trap down after the feeding has been accomplished. We have seen this in operation on many farms, and believe it one of the handiest contrivances a man can put in.—"American Agriculturist."

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Army-worms and Cut-worms may Suddenly Appear.

Keep a lookout for the occurrence of caterpillars of *Cirphis unipuncta*, which, when plentiful, often check the growth of young cane, maize plants, &c., by devouring the central leaves.

Multitudes of these caterpillars are occasionally noticed infesting low-lying land supporting rank grasses on or near river banks, &c., from which later broods of this pest may ultimately travel in a vast army and invade caneland. Caterpillars of the cut-worm *Mocis frugalis*, and of the leaf-eating grass worm (*Laphygma exempta*) may at any time swarm in countless thousands over cane growing near headlands.

A furrow drawn across their track, with the front edge cut vertically to prevent climbing, or a band of powdered lime about an inch deep are said to prove effective barriers to the advancement of such caterpillars. To prepare a good poison-bait mix 1 lb. of Paris green with 20 lb. of bran, adding to this 2 quarts of molasses, and sufficient water to reduce the bait to a thick crumbling mass. This, if sprinkled thinly along any border of cane land threatened with invasion, will check the advancing caterpillars. Another good poison-bait, recommended for *Cirphis unipuncta*, consists of 20 lb. bran, 1 lb. Paris green, 2 quarts syrup, 3 oranges or lemons finely ground, and 2¾ gallons water.

This bait should be scattered broadcast during early evening, as soon as the caterpillars begin to feed.

Check the Ravages of Termites.

Growers at Ayrdale, Jarvisfield, and Pioneer Creek, in the Burdekin district, should continue to fight this pest by means of such commonsense methods as burning infested logs or timber close to headlands. One part of white arsenic mixed in six parts of molasses is said to have proved effective for treating fence posts, &c., harbouring termites. In cases of serious infestation, try to locate the source of such invasion, which may proceed from some termitarium situated near at hand. Such pests, when found, should be thoroughly fumigated with carbon bisulphide.

The Best Way to Combat Weevil-borer.

Watch the growth of cane on river flats, where cane-borers are likely to occur; and when discovering evidence of this pest having commenced attack on the basal portion of sticks, communicate at once with the Entomologist at Meringa. Tachinid fly parasites will be released by the Sugar Bureau free of cost on areas affected by this insect, on condition that growers will agree to leave at least a-quarter of an acre of uncut grub-infested cane for the parasites to breed in. This should be allowed to remain uncut for about three months and not be burnt.

Fighting Cane Grubs.

Grubs of *albohirtum* (grey-back cockchafer) have now entered upon their second instar, and are able to effect serious damage to cane roots. The following hints respecting the application of carbon bisulphide will be found helpful:—

(1) Fumigation should not be carried out at a time when the porosity of the soil is closed by an excess of moisture, as happens just after a soaking downpour.

(2) Injections made during high temperatures, or when the soil lacks sufficient moisture, may injure very young cane.

(3) In light volcanic soils the ground is generally open and in good condition for treatment a few days after heavy rain; as the surface being then caked prevents escape of the bisulphide fumes, and all that is necessary is to close with one's foot the holes made by injector.

(4) Do not cultivate the soil until a week or so after treatment.

(5) An application of carbon bisulphide improves exhausted soils by destroying certain injurious bacteria.

(6) Examine the roots of a few stools to find at what depth the grubs are working, and then arrange for injections to be made an inch or two above them.

During ploughing operations, &c., collect the grubs when plentiful. They will be mostly those of the second-stage of *a'bohirtum* and *frenchi*. All specimens should be picked up, as those of the latter species are likely to do a good deal of damage during September to November next, when its grub has entered upon the third instar.

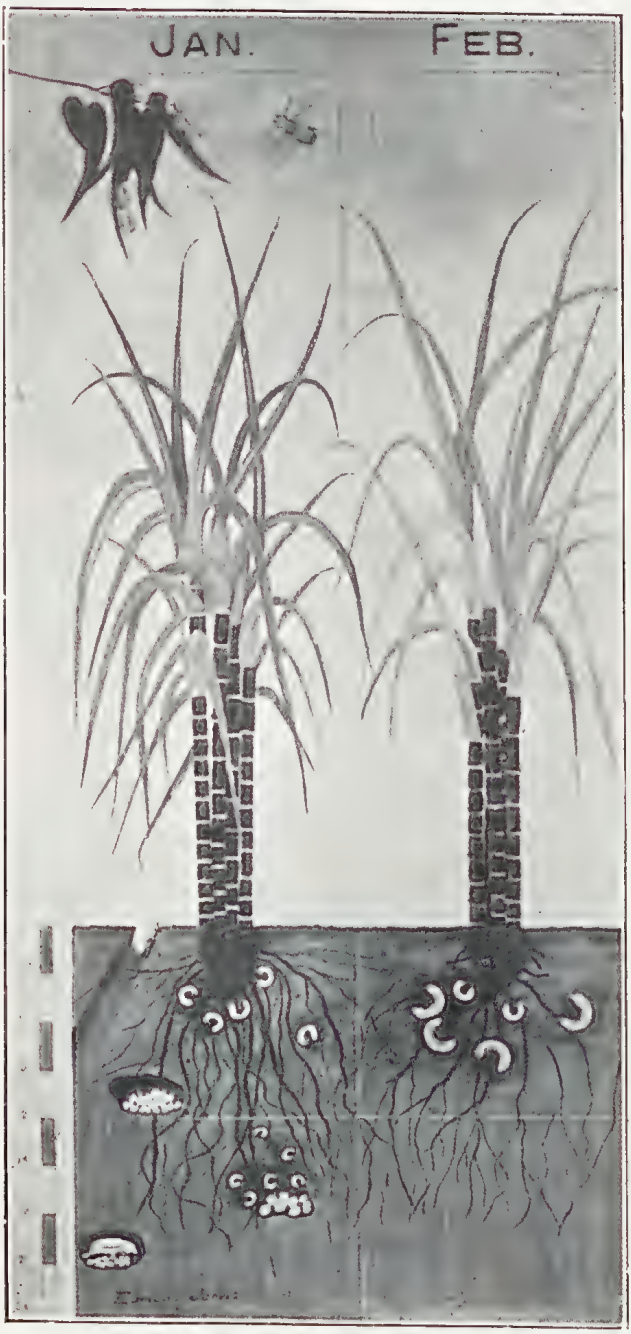


PLATE 47.—SUBTERRANEAN ACTIVITIES OF GREY-BACK COCKCHAFER.

Showing second-stage grubs injuring roots this month.

SCIENCE NOTES.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

THE EXOSKELETON IN LEPIDODERMA AS AN INFLUENCING FACTOR IN THE ECONOMY AND CONTROL OF OUR GREY-BACK COCKCHAFER.

On a subject so exceedingly complex, which embraces many branches of scientific research, one cannot, in an article of this kind, do much more than touch briefly on a few significant points likely to possess interest for the economic entomologist.

Osteologists tell us they are able to restore the complete skeleton of an animal from an examination of such seemingly scanty material as two or three bones; and, in the event of its being that of some prehistoric monster, to even determine approximately its general appearance and probable habits.

In the case of existing animals, belonging, say, to class Insecta—the entire anatomy of which can be carefully studied in detail—the structure of the exoskeleton is always wonderfully adapted to suit the habits and requirements of each species.

Modifications of the Trophi and Coxae.

Familiar examples of such adapations are observable in the mouth parts of mandibulate insects, the maxillæ and mandibles, for instance, being in predaceous coleoptera, such as Cicindelidæ, more or less sickle-shaped, keen, and often furnished with formidable teeth. (Figs. 40, 41, Plate 48, p. 247.)

The structure of these organs in *albohirtum*, however (Figs. 2, 3)—a species having no need to catch or retain its hold on struggling insects, &c.—clearly indicates herbivorous habits, these organs being adapted merely for cutting and crushing up the leaves of trees.

Take, as another illustration, the formation of the coxæ, which in typical Carabidæ are almost globular, thus permitting freedom of movement in almost any direction, enabling the insect to dart with great rapidity in pursuit of prey; whereas, the formation of the coxæ in *albohirtum* (Figs. 27, 27, 27, Plate 48, p. 247) indicate slow and somewhat cumbrous movement, sufficient, however, to allow the beetle to cling firmly to leaves or crawl leisurely among the foliage.

Olfactory Organs.

It has long been known that the olfactory sense in insects resides mainly in the antennæ (Fig. 4). Chemotropic reaction occurs during periods of mating, oviposition, &c., the sexes in many instances being able to quickly locate each other from long distances by the help of certain subtle odours secreted by special scent glands; while egg-laden females of insects, such as *albohirtum*, are similarly guided in the search for food for themselves or their larvæ.

As previously pointed out by the writer ("Queensland Agricultural Journal," vol. XVIII., p. 307) the olfactory pits or pori found in the antennal lamellæ number about 28,000 in the male, and 18,000 in the club of a female grey-back (Figs. 36, 37, 38); the antennal club of the former sex, however, consisting of five plates, while that of the female has only four. Each olfactory pit contains a central peg-shaped body of variable form and length, usually tipped with a short seta, and connected with the olfactory nerve by means of a slender fibre. (Fig. 36.)

From such facts as the insertion of the antennal organs of this species in a groove under the clypeus and labrum in order to protect it from external injuries, and the club being kept tightly closed when not in use, we may infer that these highly-specialised organs are of vital importance to the insect.

Consistency of the Chitenous Integuments.

If we compare the weight of the exoskeleton of *albohirtum* with that of other closely related species of scarabæidæ we shall obtain another hint of economic value. It has been estimated that 1 lb. of grey-back cane-beetles represents about 216 specimens; so that in spite of its bulk a single individual weighs on an average

only two scruples—viz., the weight of an ordinary wine cork. *Anoplognathus boisduvali*, an insect scarcely half as big, is, nevertheless, slightly heavier; while *Calloodes grayanus*, although not three-quarters the size of *albohirtum*, turns the scale at about 2½ scruples.

These differences in weight, which were determined by the writer from living specimens, are due to variations in the consistency of the exoskeleton, parts of which, in *albohirtum*, are so thin as to be almost coriaceous; whereas, in *Anoplognathus* and *Calloodes*, the chiten is comparatively thick and horny.

Significance of the Organs of Flight.

Studying the structure of the elytra and wings (Figs. 21, 22, 23), we notice that special provision has been made for extended or long-continued flight. The wing-cases (Fig. 21) which are unusually light in proportion to their size, are deeply concave below, and when the beetle is making use of its long and powerful wings, these elytra project laterally, parachute-like, from each side of the body, thus helping the insect to maintain a steady and straight course through the air.

Formation of the Tibiae and Clypeus.

Again, from the structure of the legs (Figs. 24, 25, 26) we may reasonably assume that *albohirtum* would experience great difficulty when attempting to burrow through hard compact soil; for although its anterior tibiæ (Figs. 24, 30) are undoubtedly formed for digging, they are weakly in proportion to the bulk of this species, while its slender intermediate and posterior tibiæ (Figs. 25, 26, 30) were evidently not made for such strenuous work. Compare these with the tibiæ of a Coprid beetle (Figs. 33, 34) which in each pair of legs are strongly toothed, and eminently suited for boring through hard ground.

In this connection, I may mention that the anterior edge of the clypeus in our grey-back (frontal portion of head, Fig. 6) being obtuse, affords little or no help to a beetle endeavouring to force a passage to the surface; whereas in *Bolboceras* both clypeus and mandibles unite to form a sharp-edged spade projecting in front of the head; the mandibles, indeed, which are flattened and concave laterally, being in this genus wonderfully adapted for digging, breaking up, and shovelling particles of soil.

Coloration.

The exoskeleton in *albohirtum* is of a uniform dark-reddish-brown externally, this colour being more or less hidden under a covering of white scales and hairs. The beetles when feeding usually cling to the under surface of leaves, and although conspicuous when viewed from the ground, are probably not easily seen from above by birds and other foes, owing to portions of the venter (Fig. 20) being without vestiture.

Nature has not accorded this species the marvellous protective coloration so commonly seen in insects of the orders Lepidoptera, Orthoptera, &c.; but has given it—perhaps as a compensation—the advantages of:—(1) Overwhelming numbers; (2) a wide range of dietary; and (3) special protection during its egg, larval, and pupal conditions.

A female grey-back lays on an average twenty-seven eggs, which being deposited in a subterranean chamber situated from 1 to 2 ft. underground, are practically safe from attacks of predaceous and parasitic enemies.

Nearly 100 per cent. of these eggs hatch out about a fortnight after deposition; and despite attacks of scoliid wasps about 90 per cent. of the grubs probably succeed in ultimately pupating.

An infestation of only four larvæ per stool means an emergence the following season from 1,000 acres of such grub-eaten cane of nearly 23,000,000 cockchafers. Assuming half of these to be females (a low estimate), and deducting an additional 10 per cent. to allow for losses from natural enemies, leaves us 11,000,000 females, which would weigh 22 tons. However, what I wish to point out is that the protection

afforded *albohirtum* during its earlier life-history stages does not, apparently, extend to its imago condition, since the beetles when resting in feeding-trees by day are not only fully exposed to the attacks of insectivorous birds, but being at such times in a sleepy or torpid condition are unable to offer effectual resistance. Fortunately, this beetle can well afford such thinning of its ranks, which is only one of many natural controlling agencies designed to prevent excessive and injurious multiplication of a species.

Control Measures, as Revealed through the Study of External Anatomy.

Reverting to those portions of the exoskeleton mentioned above, it is interesting to find that from such structural differences we may derive a few valuable hints relative to methods of combating this notorious cane pest.

Firstly.—From consideration of its highly-specialised antennal organs we have seen that chemotropism doubtless exercises an important influence on the movements of this beetle. It may be possible, therefore, to attract specimens of either sex from a distance by the means of artificial odours resembling those emanating from their favourite food-plants or other substances, and so lure them into suitable traps. This fascinating phase of control opens up an exceptionally wide field for investigations of a biochemical nature, and any success that may be attained in the future would prove of inestimable value.

Secondly.—By noting the coriaceous texture of the exoskeleton of our grey-back, together with its exceptional lightness in weight, we are led to believe that Nature has, by this means, provided for its wide dissemination or migration through agency of the air, by giving unusual buoyancy to newly emerged specimens during the period preceding oviposition. The correctness of such an assumption is substantiated by examination of the organs of flight, which, as already mentioned, suggest at once the suitability of *albohirtum* for aerial transportation. Naturally, a habit of such vital moment in its economy would materially affect the utility of any artificial control measures that might be brought to bear on the matter; since such factors as: (1) The topography of an affected district; (2) its geographical position; (3) the geological nature of the country; and (4) the character, disposition, and relative abundance of timber in the vicinity of affected farms, would each have to be carefully studied in detail.

Thirdly.—With regard to the dietary of this cockchafer—as betrayed by the structure of its mandibles and maxillæ—I may say that its habit of resting by day amongst the leaves of trees in a semi-torpid state has led to the adoption of the well-known remedial method of collecting the beetles.

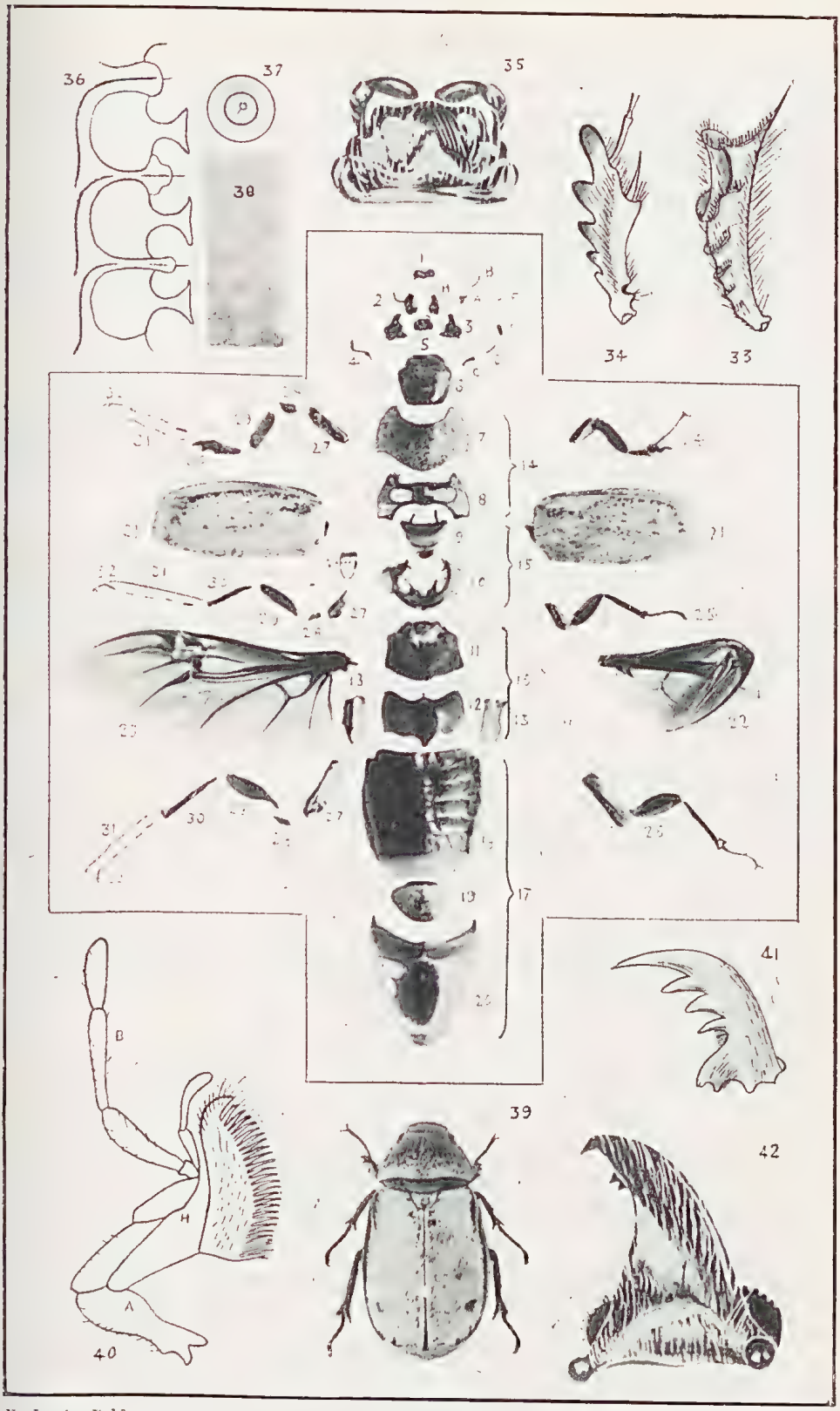
In the case of *albohirtum* the favourite feeding-trees are visited by collectors at daybreak, and when these are suddenly shaken or jarred, the cockchafers instantly release their hold of the leaves and fall to the ground.

Fourthly.—We should thank Nature for having denied this dread ravager of our canefields the ability to tunnel through hard soil.

The unsuitability of its tibiæ, clypeus, and mandibles for such work, as alluded to above, are seen to be facts of paramount importance when one realises that merely because of this weak point certain natural controlling factors are able at times to bring about its wholesale destruction over very extensive areas. This happens when a period of drought chances to occur at a time when these beetles, having emerged from the pupæ, are waiting in their underground cells for rain to soften the ground sufficiently to enable them to tunnel to the surface.

When forced to wait from eight to ten weeks in the pupal chambers many millions of specimens must inevitably perish, such checks often serving to hold the pest in subjection for two or three years.

[NOTE.—This method of mounting the external anatomy of an insect, as shown on accompanying plate, was originated by the writer in the year 1890, when a series of typical Victorian insects of all orders was prepared in this way for the Departments of Agriculture and Education, for purposes of exhibition and nature study.]



E. Jarvis, Del.]

PLATE 48.—EXTERNAL ANATOMY OF "GREY-BACK" CANE BEETLE (*Lepidoderma albohirtum*, Waterh.).

EXPLANATION OF PLATE.

Fig. 1—Labrum (upper lip).
Fig. 2—Maxilla, A—cardo, B—palpus (3-jointed), H—stipes.
Fig. 3—Mandibles (jaws).
Fig. 4—Antenna, C—scape, D—pedicellus, E—club.
Fig. 5—Labium (lower lip); F—palpus (2-jointed).
Fig. 6—Head.
Fig. 7—Pronotum.
Fig. 8—Prosternum.
Fig. 9—Mesonotum and scutellum.
Fig. 10—Mesosternum, G—episternum.
Fig. 11—Metanotum.
Fig. 12—Metasternum.
Fig. 13—Episternum and epimerum.
Fig. 14—Prothorax.
Fig. 15—Mesothorax.
Fig. 16—Metathorax.
Fig. 17—Abdomen.
Fig. 18—Dorsal abdominal surface.
Fig. 19—Pygidium.
Fig. 20—Ventral abdominal surface.
Fig. 21—Elytra.
Fig. 22—Wing, as folded under elytron.
Fig. 23—Wing extended for flight.
Fig. 24—Anterior leg.
Fig. 25—Intermediate leg.
Fig. 26—Posterior leg.
Fig. 27—Coxæ.
Fig. 28—Trochanter.
Fig. 29—Femora (thighs).
Fig. 30—Tibiæ (shanks of legs).
Fig. 31—Tarsi (feet).
Fig. 32—Claws of tarsi.
Fig. 33—Posterior tibia of *Bolbocerus*.
Fig. 34—Anterior tibia of *Bolbocerus*.
Fig. 35—Labium of *albohirtum* (magnified).
Fig. 36—Vertical section through plate of antennal club of *albohirtum*, showing olfactory pits.
Fig. 37—Plan of an olfactory pit.
Fig. 38—Photograph of portion of surface of an antennal plate, showing arrangement of olfactory pits.
Fig. 39—Female of *Lepidoderma albohirtum* (natural size).
Fig. 40—Maxilla of *Harpalus caliginosus* (after Folsom).
Fig. 41—Mandible of *Cicendela* (magnified) (after Hagen).
Fig. 42—Mandible of *L. albohirtum* (magnified).

CANE PEST COMBAT AND CONTROL.

The Entomologist at Meringa, Mr. E. Jarvis, has forwarded the following report (21st February, 1925) to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

NOTES ON THE TERMITE PROBLEM.

This pest seems likely to be one of considerable economic importance, being particularly troublesome on some farms in the Lower Burdekin district, where it is said to be responsible for serious damage to young ratoon and plant cane.

These termites enter the sets at the cut ends, and after destroying the softer portions attack the growing buds and young shoots, the latter often being killed outright when only six or eight inches high, or even before able to appear above ground.

There is always a danger that indigenous insects may gradually come to acquire a liking for cultivated or introduced plants; more especially when extensive areas originally supporting a diversified flora are suddenly cleared and devoted to exclusive cultivation of crops—such as cane, cotton, &c.—chancing to be closely related botanically to some of the food-plants of native insects occurring in such districts.

The termite *Mastotermes darwiniensis* Frogg. appears to be commonly distributed in parts of Northern Queensland, and being a timber-feeder and used to swarming during the mating season over the face of the country, many of the female termites when coming to rest in a wingless condition after the marriage flight would naturally find themselves in cane land and be compelled to remain and if possible breed there.

It is this method of propagation of a species, by means, apparently, of irresponsible uncontrolled flight in any direction, that bids fair, in the writer's opinion, to render this termite a formidable menace.

During the flighting period, however, by far the greater number of winged males and females probably come to rest amongst timber bordering creeks, on headlands of canefields, and on small uncleared patches near or among cane areas.

Fortunately the feeble wings after flight easily become detached and fall off, leaving these soft-bodied defenceless insects a prey to innumerable enemies. Birds, small animals, and many mandibulate insects, such as ants, carabid beetles, &c., greedily devour them, so that very few manage to escape to form new colonies.

EXPERIMENTATION AGAINST TERMITES AT LABORATORY.

Paradichlorobenzene.

Experiments conducted last August with termites in cages of soil demonstrated the value of paradichlor as a fumigant against these insects, 100 per cent. mortality having been obtained six days after an application of doses of one-thirty-second of an ounce.

Poisoning Sets.

Positive results were secured also by dipping pieces of cane-stick before planting in solutions of 1 to 2 lb. Paris green, or lead arsenate in 24 gallons of water (see monthly report, August to September, 1924), these results indicating that the termites in each cage having worked towards and discovered the sets, had attempted to eat into them and so been poisoned. Another experiment with lead arsenate (1 lb. to 12 gallons water) made last December, yielded somewhat similar results.

Carbolineum.

Dipping sets before planting in solutions of carbolineum gave inconclusive results, this insecticide, however, being sufficiently repellent to deter 40 per cent. of termites from entering the cut ends; while in the control cages every set was bored into.

Coal Tar.

In these experiments the ends of some of the sets used were dipped in the deterrent, while other sets, in addition to having the ends coated, had the buds covered over with the tar.

In the former case, such treatment in every instance was found to protect the set from invasion, but in each control cage the termites entered the cut ends.

(*Note.*—When put in with the treated sets they got as far away from them as the cage would allow, but were at once attracted to the untreated sets.)

Covering the eyes and ends with tar proved equally repellent. The sets were planted 4 inches deep, and when examined nearly three weeks later the eyes were germinating in a normal manner, and no damage to sets could be detected.

Kerosene Emulsion and Sodium Arsenite.

This dipping solution consisted of kerosene emulsion (½ lb. hard soap, 2 gallons kerosene, 1 gallon water) 10 per cent. strength; to which was added sodium arsenite at the rate of 1 oz. to each gallon of the emulsion. This preparation has previously been recommended by the United States Department of Agriculture for swabbing

wood infested by termites. Five treated and four control cages were used in our experiment, each containing twenty specimens of *Mastotermes darwiniensis*.

When examined seven days after application an average of four living ants was found in each treated and of fourteen in each control cage. None of the poisoned sets were touched by the termites, but all the untreated sets were chewed or slightly eaten by them.

Dehydrated Tar.

This deterrent, which was brought under my notice by the Director, appears to have come into favour of late years, large quantities being used at present in other sugar-growing countries for the treatment of cane sets before planting, as a protection against soil-frequenting grubs and other pests. Recent experiments with it here, in connection with the control of *M. darwiniensis* have yielded very promising results.

On 23rd January ten treated and four control cages of soil containing cane sets were prepared, and twenty healthy specimens of this termite placed in each. In five cages the ends only were dipped in the tar, and in five the ends and eyes. When examined eight days later 16 per cent. of termites were alive in the ten treated cages, and 55 per cent. in the four controls. In six of the treated cages the mortality was 100 per cent. None of the poisoned sets were touched, while all the control sets were more or less eaten into. The sets in all fourteen cages were seen to be striking normally.

Fumigation of Cane Land.

By the time this report appears, opportunity for successful fumigation of cane grubs will have probably gone by for the present season.

The best months for such treatment are November and December, when grubs are too small to seriuosly damage the cane, and the soil is most likely to be in fitting condition for fumigation.

Many growers, however, still persist in waiting until external evidence of infestation is apparent before beginning to think about applying any remedy, by which time it often happens, either that the wet season has set in, or the ground become too moist for fumes to penetrate between the soil particles. At such times, those injecting carbon bisulphide, paradichlor., &c., and getting negative results are liable to blame the fumigant used, as being no good for destroying grubs. Practically, the correct time in which to apply carbon bisulphide, paradichlor. or calcium cyanide depends on the date of emergence of grey-back cane-beetles.

These usually appear on the wing during December, as will be seen from the following table:—

1914	Beetles	emerged on	December 5
1915	„	„	December 11
1916	„	„	November 7
1917	„	„	October 29
1918	„	„	October 15
1919-20	„	„	January 15
1920	„	„	November 5
1921	„	„	December 2
1922	„	„	December 22
1923	„	„	December 7
1924	„	„	December 13

To be on the safe side, it is advisable to commence the work of injecting paradichlor. about a fortnight after first appearance of the beetles.

We see, therefore, that eminently favourable seasons for grub control by means of fumigation are those in which emergence of the beetles takes place in October or the beginning of November, while most of the cane is still young and the ground free from excessive moisture. Emergences occurring early in December are also favourable, since fumigation can generally be practised during the latter half of this month and most of January.

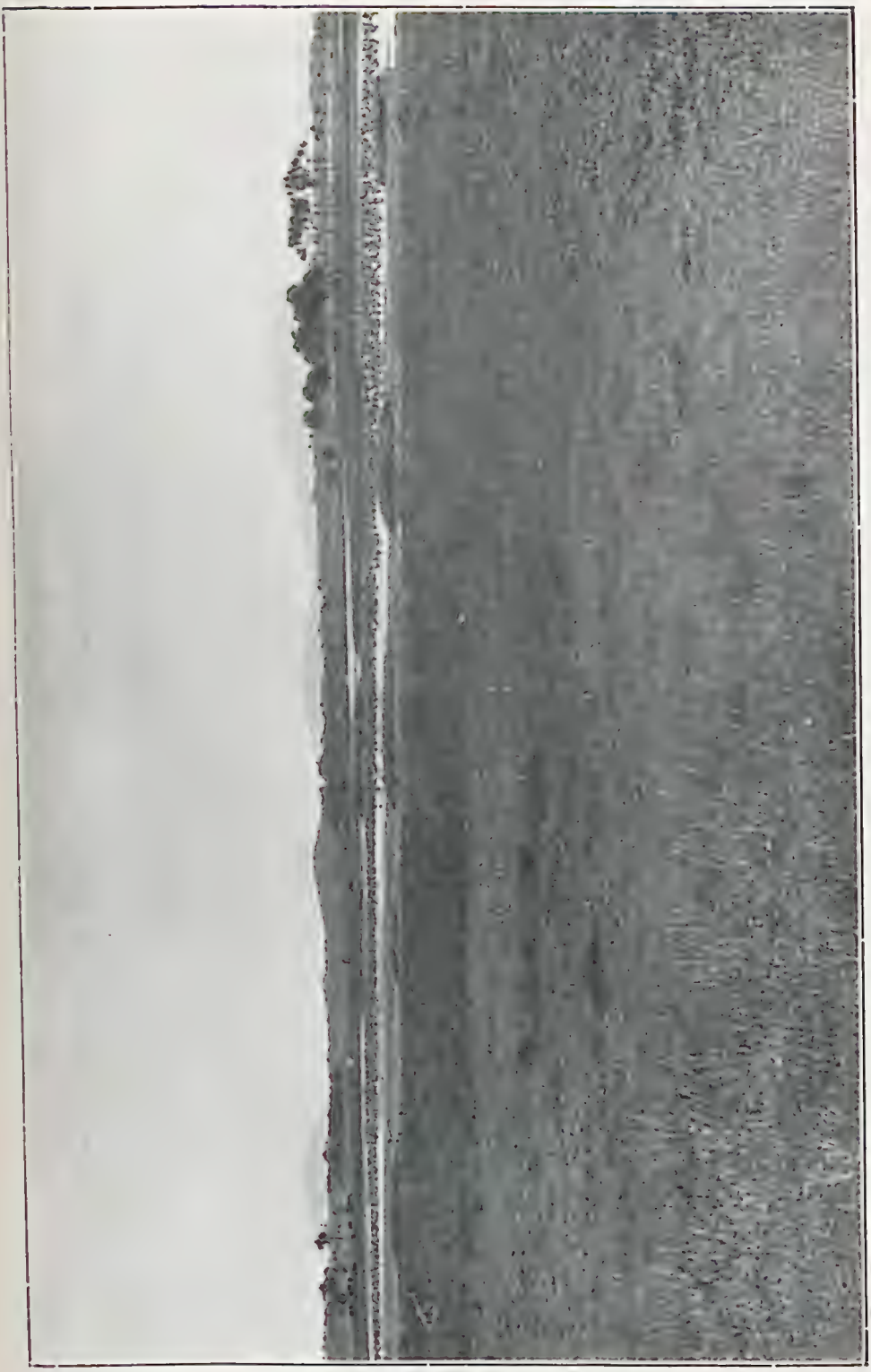


Plate 49.—Wild Game at Rest. On the Property of Mr. F. Cassady, Mungallala, Ingham.
Realising the importance of preserving native fauna, the Queensland Government has proclaimed and reserved native bird and animal sanctuaries in various parts of the State.

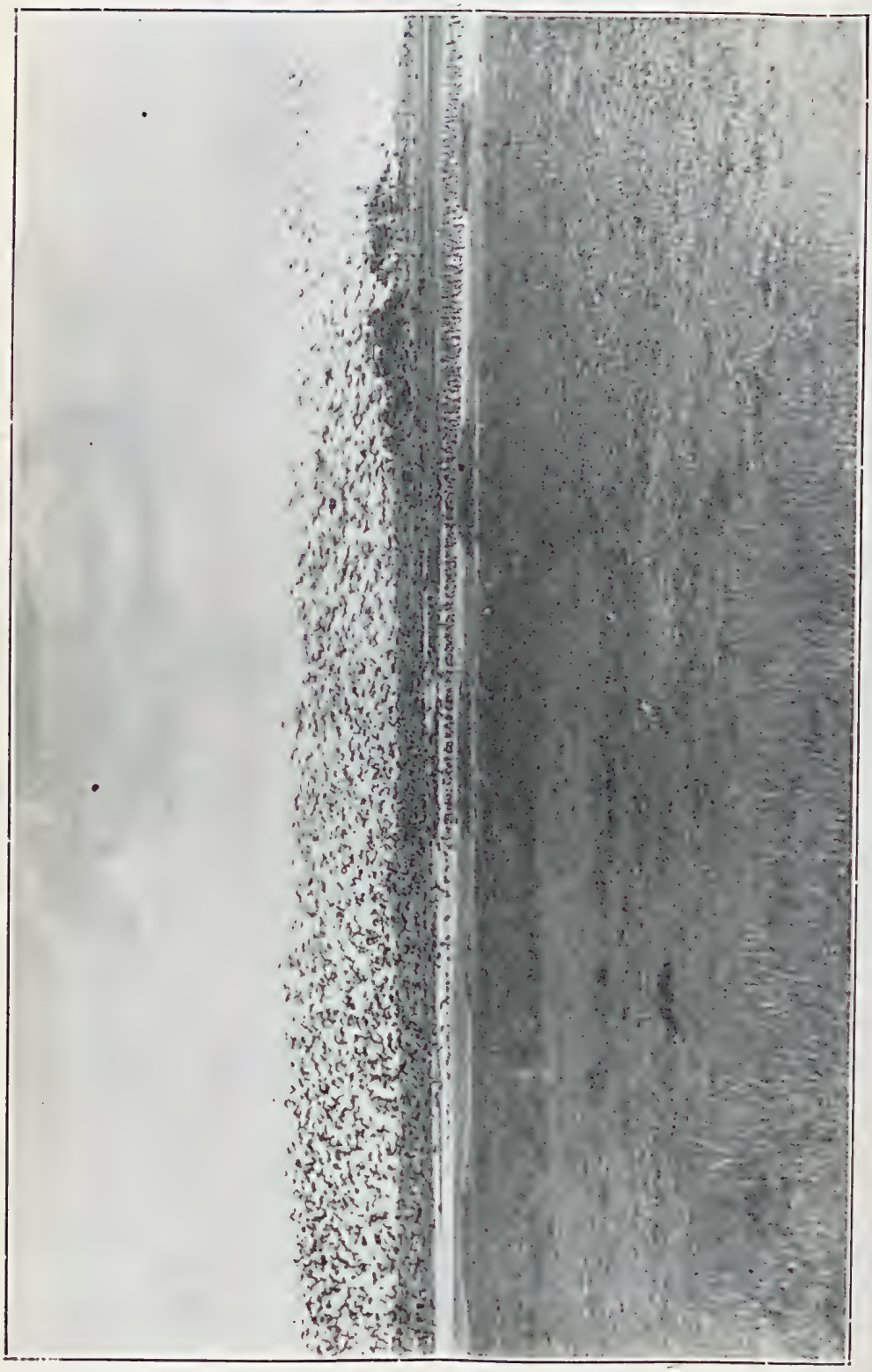


PLATE 50.—WILD GAME IN FLIGHT.
On the Property of Mr. F. Cassady, Mungallala, Ingham

General Notes.

Poisoning Green Timber with Sodium Arsenite.

Ordinary ringbarking is effective if done at the right time for the particular district, for it must be conceded that seasons vary considerably from year to year, making the operation an adjustable one. But ordinary ringbarking has one disadvantage—it is slow, often taking twelve or eighteen months before the trees can be burnt off.

Of late years, the action of arsenic has been introduced with marked success in hastening the killing by the ringbarking process, and trees that ordinarily take months to kill by the old method, are now killed in a few weeks, and frequently in a few days, by the application of arsenic.

The time to carry out the work of poisoning is when the tree is dormant—that is, when the sap movement is at its minimum and the sap right down in the roots and lower portions of the trunk. This occurs in the months of, say, March to July, according to the district. The main object in catching the sap to season is to prevent suckering. Trees can be killed by arsenic or ringbarking at practically any time of the year, but to prevent this suckering it is highly important to operate when the sap is down, or just completing its downward course.

Superphosphate for Wheat.

Interesting comments on the changing attitude of wheatgrowers to manure are made by the senior agricultural instructor in the central-western district of New South Wales, in the course of a report on the recent crop-growing competitions at Parkes, Forbes, Trundle, and Coradgery. Every competitor in the Parkes competition applied superphosphate to his crop, it is stated, the average amount working out at 54 lb., while of the eighteen crops in the Forbes competition, fourteen were manured with superphosphate at the average rate of 53½ lb. per acre. All the twenty-two entries in the Trundle competition had been aided with superphosphate at the average rate of 50 lb. per acre, and of the eleven crops in the Coradgery competition, ten had been manured at the average rate of 42 lb. per acre. In all centres the quantities varied from 30 to 90 lb. per acre, but the greatest number of crops were manured at the rate of from 45 to 60 lb. per acre.

This indicates a marked change from the position of three years ago, remarks the writer, when the question generally asked was—"Do you advise me to use manure?" To-day the question is, "How much can I safely apply?"

And here a note of caution is not out of place. Extremes must be avoided, as excessive quantities will depress yields, producing too dense and flaggy a growth, small ears, and a crop liable to lodge. But what is an excessive quaitity has yet to be determined for this western district. It is only three years since superphosphate commenced to be generally used, and it was first used in such small quantities as to act more as an irritant than a stimulant. It is only in the past season that a respectable helping has been given to the wheat plant, though a few gave a banquet allowance, using up to 90 lb. per acre. The "excessive" quantity was probably safe this year, but the advice is to "go easy" and work up by small quantities. Superphosphate will ripen a crop early, and if judiciously applied is economical as far as the available moisture is concerned, but we must avoid a crop development of ten bags if the moisture available will only mature eight bags.

At the present time a safe recommendation for use on well-worked fallow is 60 lb. per acre. In special cases, with a full knowledge of requirements, 70 lb. is safe. Any quantities above this must be treated in the way of an experiment. Excessive quantities of superphosphate will produce tall, coarse-stemmed, flaggy plants, if the seeding is thin, and it will induce lodging. Very heavy seeding will also induce lodging, but the two combined will have a worse effect than the last straw had on the camel.

Experiments have been established throughout the district to determine the most suitable quantity of superphosphate to apply per acre, amounts ranging from 32 lb. to 84 lb. being used, so within three or four years farmers should have a good guide as what is the maximum safe limit.

Superphosphate will certainly promote increased root development, growth, and stooling, but it is not wise to apply more than a safe quantity in an endeavour to counteract a reduced seeding. What we have to determine is the maximum safe limit of seed and manure combined that can be economically used.

Beans and Peas as Stock Food.

Beans and cowpeas are similar products of leguminous plants, and closely approach each other in feeding value and characteristics, peas being slightly binding in the form of meal, and beans a little more so, hence they must be fed with foods of a counteracting nature. Both are eminently suited because of their richness in albuminoid matter for use in limited amounts in the horse ration. Being hard seeds, such products should always be ground. Their proper use in a ration for horses is as a somewhat concentrated protein feed, to be combined with feeds high in carbohydrates, such as molasses and maize. Digestive troubles are very liable to occur if one or more of these feeds exceed one-third of the concentrate ration.

These products are not extensively used in this State as stock food, although their analysis shows them to be twice as nutritious as maize or oats. It is largely because their valuable qualities are not known that they do not form an important dietary of working horses. A good mixture is composed of 8 bushels peas, 8 bushels maize, and 1 bushel whole linseed; all ground up together and fed with chaff in the same proportions as good oats. They can also be given with oil-cake, bran, or similar food for fattening stock. For sheep and cattle, however, they are chiefly used in this country as fodder crops.

Tree Planting—Looking Ahead.

The president of the Royal English Arboricultural Society (Mr. Leslie S. Wood) declares that "afforestation to-day on modern lines is a profitable undertaking." The Great War was a war upon timber, no less than upon manhood, in all the great countries affected by it. In France, where the active fighting took place, forests were destroyed ruthlessly; but all the combatant countries had to draw on their forest supplies to keep the fight going. English landowners had to slaughter their young trees for pit props to enable coal to be got out at feverish haste for the army and navy. It is instructive to note what has been done since the war to repair this great wastage. In two years the Forestry Commission planted 20,324 acres in England, Scotland, and Wales, and it has purchased, or leased, another 93,290 acres in preparation for planting during the next five years. The services of the unemployed are used in this work, and in three years the Forestry Commission has paid unemployment grants in respect of 20,330 acres planted by private individuals or corporations, so that at the end of each season the stock of plants in the hands of the nurseryman has been practically exhausted. The unpopularity of timber, as a crop, lies in the fact that the crop is so long in maturing. The tree planter plants for posterity. But if the value of British estates is to be maintained this tree-planting has to be done. Experts are able to show how the system works out. At twenty years a good growing larch tree will increase as much as 20 per cent. in the following year, and at forty years the extra growth will still be about 6 per cent. a year. Forest surveys that have been completed in the counties of Suffolk and Hertford show that 42 and 66 per cent., respectively, of the woods in those counties are over eighty years of age, and on an average the annual percentage growth is probably under 3 per cent. Many of these woods are growing at the rate of only 2 per cent., and some as low as 1 per cent. Although, scientifically, timber should not be cut till the tree is dead ripe or has ceased growing, many landowners in England are realising that it is not profitable to retain the aged and very slow-growing trees—that it is a better proposition to cut them down, realise on them, and plant young trees, which, year by year, will be growing into value at a rapid rate. If this replenishing of the forests is necessary in Britain, how much more so is it desirable in a young country like Queensland, where so much land is being ruthlessly denuded of valuable timber to make way for the plough and artificial crops? In no civilised country in the world, perhaps, is "tree-murder" practised so extensively and so thoughtlessly as in this State. In this connection Messrs. Lahey Bros. may be complimented on the action they have taken in establishing a nursery for pine trees at Canungra, and in planting 200 acres on Oxley Creek, near Corinda, as a reserve pine forest for future timber supplies. This is a far-seeing and practical step that constitutes a worthy example for others to follow.

Answers to Correspondents.

A Useful Fodder Tree.

Mr. W. Young, of Moongabulla, *viâ* Townsville, N.Q., writes:—

"I am sending you a small branch of a splendid fodder tree that grows up and down the beach here. Cattle are very fond of it and do not leave a leaf that they can reach. Can you tell me the name of it and anything you know about it?"

The Government Botanist (Mr. C. T. White) advises:—

"The specimen sent with Mr. Young's letter on the 7th instant proves to be *Sideroxylon argenteum*—the specific name argenteum referring to the slight silvery sheen of the under surface of the leaves. The tree is fairly abundant in parts along the Queensland coast from Maryborough to Cooktown.

"The only local name I have heard applied to it is that of 'Necklace Seed Tree,' owing to the hard brown seeds sometimes being used in making necklaces.

"Mr. Young's note on the fodder value of the tree is of great interest, as the present plant has, so far as I know, not come under notice as a fodder. Attention has already been drawn in the 'Queensland Agricultural Journal' (August, 1922) to the fodder value of another North Queensland species of the genus."

Paralysis in Pigs.

L.O. (Pomona)—

The Instructor in Pig Raising (Mr. E. J. Shelton) advises:—It is always very difficult to definitely diagnose any illness amongst stock unless one is able to inspect and to ascertain the exact conditions under which the stock are kept, fed, and housed. Paralysis of the hindquarters is a very difficult disease to understand, for there are so many different causes, but you will find the following treatment well worth while. If it is suspected that the trouble is due to worms, whether they be kidney worms, stomach or intestinal worms, or both, give the animal the following medicine, this dose being sufficient for a pig weighing up to 50 lb. live weight:—

One teaspoonful of oil of turpentine,
Twenty drops of liquid perchloride of iron, and
Three or four ounces of raw linseed oil.

Mix these drugs together and give as a drench (preferably), or in the food if the animal has a good appetite. The pig should be fasted for about twelve hours before the medicine is given, and it can be repeated several times, with an interval of three or four days between each dose.

If it is suspected that the trouble is due to faulty feeding or lack of minerals in the food, give the following mixture in the food once daily for, say, one week or more. One dessertspoonful of a mixture composed of the following ingredients, which should be well ground and mixed in the food before use:—

	oz.
Flowers of sulphur	2
Sodium bicarbonate	4
Sodium sulphate	2
Black antimony	2
Sulphate of iron	1
Wood charcoal	2

One dessertspoonful only of this mixture at any one time. The food should be of a soft nourishing nature, and the animal should be allowed ample green food, like lucerne, &c., in addition to a liberal supply of clean water.

It has also been found that pigs which have abundant exercise, a good pasture over which to graze, and ample supplies of charcoal, wood ashes, a lump of rock salt to lick, and about a tablespoonful of lime water added to their food daily, will improve in condition and recover. The above treatment should suit your four months' old pigs, and any chemist would make up the mineral mixture or the worm remedy for you.

A pamphlet dealing with mineral mixtures for pigs has been forwarded.

Crossbred and Purebred Pigs.

W.G. (Baking Board)—

There is no hard and fast rule in regard to cross-breeding, though, generally, better results are secured by using a purebred Berkshire boar with Tamworth sows, or with crossbred Tamworth-Berkshire sows. It is sometimes difficult, however, to obtain good-class sows of these types, and the use of a Tamworth boar with Berkshire sows is frequently recommended, the idea being that the sows of this cross should, when available, be mated with a Berkshire boar. The progeny would then possess two strains of Berkshire to one of Tamworth and, wherever used, crosses of this description have proved entirely satisfactory.

The Department has Berkshire boars for sale at the Warren State Farm, near Rockhampton, and at Kairi, on the Atherton Tableland. The College stud usually has stud stock available, but at present the bookings there are well ahead, and stock will not be available for some time.

Ailing Pigs.

R.C. (Maleny)—

The Instructor in Pig Raising (Mr. Shelton) advises:—It is very difficult to definitely diagnose sickness in pigs without inspection. Your pigs would appear to be suffering as a result of exposure. Possibly, as a result of the recent severe weather, the pigs have developed symptoms in many respects characteristic of pneumonia. Some of the symptoms also resemble rickets, the cause of which is a deficiency in the supply of lime salts in the diet, combined with other unfavourable conditions, such as lack of exercise, muddy yards, &c. Pneumonia usually begins with a severe fever induced by increased body heat of the sick animal. Shivering fits are common, accompanied by markedly quickened breathing, muscular weakness, faintness, reddening of the mucous membrane of the eye, and loss of appetite. The animals when thus affected stand with the fore legs wide apart, and there is frequently a short, harsh cough.

Treatment.—Careful feeding, increased attention to the comfort of the animal, particularly in so far as this relates to their sleeping quarters, which should be warm and dry and free from cold draughts, accumulations of dust and filth, &c. The pigs should have a liberal supply of clean, dry bedding. It is advisable to isolate the sick animals, and give only soft laxative food, milk and meal, green lucerne, or other succulent greenstuff. The pigs should also have a liberal fresh water supply. A dose of Epsom salts in the water or food occasionally is advised, the dose being from 1-oz. packet in the case of a pig, say, four months old, to 3-oz. packets for breeding sows.

Where the cause of the trouble is pneumonia, it is sometimes helpful to apply a mustard plaster smeared over the ribs and chest, and covered with soft brown paper and some cloth covering, but this is not possible in the case of very young pigs. A leaflet giving information with regard to mineral matters in the food has been posted. It is advisable to follow the course suggested in this leaflet, for though rickets is a disease affecting the bones and is most common in young pigs, it is almost entirely due to preventable causes, and a liberal supply of mineral matters in the food will tend to overcome this.

The symptoms described also indicate colic, gastritis, and possibly enteritis. These troubles are largely due to the use of bad or indigestible food, fermenting refuse, or stale milk taken from tubs or barrels in which there are accumulations of decomposed protein adherent to the sides of the tub or barrels. This particularly so during humid weather, such as has been common of late. Pigs sometimes develop a craving for sand or earth (sand hunger), and accumulations of sand in the bowels cause severe abdominal pain, to secure relief from which the animal frequently lies down, mostly on one side. Exposure to cold or the presence of intestinal worms are also contributory causes, as also is inflammation of the stomach or bowels. Treatment in these cases must first include a complete change of food to warm skim milk (minus any froth); secondly, the administration of 1 to 2 oz. of castor oil in warm milk (in the case of young pigs, or 3 oz. in the case of mature stock). Repeat the dose of oil in four or six hours if the animal's bowels are not relieved. Keep the animal warm and follow the advice given above *re* bedding, &c. Treatment must be accompanied by a removal of all possible causes, also generally improving the conditions under which the animals are kept.

Pig Breeding.

R.N.S. (Mundubbera) asks the following questions, to which answers are supplied by the Instructor in Pig Raising (Mr. E. J. Shelton):—

(1) Is it thought that a Duroc-Jersey-Tamworth cross would be a better bacon pig than a Berkshire-Tamworth cross or Berkshire-Tamworth cross mated back to a pure Berkshire boar?

Answer.—So far we have not had sufficient experience with Duroc-Jersey-Tamworth crosses to be able to answer this question as fully as would be desired, but from observation locally and experience abroad, it would appear that the Duroc-Jersey should prove a very suitable pig for cross-breeding. According to the bacon factory people, the Berkshire boar mated with a Tamworth sow produces progeny admirably adopted for the purposes of the medium-weight, fleshy bacon so much in demand. Sows of this cross mated back to a Berkshire boar of unrelated strain also gives good results, and these crosses are recommended. The Duroc-Jersey is not unlike the Berkshire in its build and the type of its flesh, hence it would appear that they could be used to advantage. Crosses of the Duroc with the other breeds are now being arranged, and it is hoped shortly to have some details available as to their value for crossing with Berkshires. An illustration of some Duroc-Jersey-Berkshire crosses is in this issue of the Journal.

(2) Is it possible to mate the boar to the brood sow three days after she farrows, and is this advisable?

Answer.—In general and under normal conditions, the brood sow will come "on heat" or "in season" about the third day after she farrows, and it is possible sometimes to successfully mate her on this occasion. Some sows, however, show no signs of coming "on heat" (or, as it is technically called, "oestrum" or the "oestral period") at this time, and will refuse to breed. The oestral period usually lasts for three days, and recurs every twenty-one days from the time the sow first comes "on heat" after farrowing. It is customary and advisable to mate the sow at about nine weeks after farrowing, or about one week after she has weaned her suckers. This (weaning) is usually done at eight weeks of age. It is not usually advisable to mate the sow three days after farrowing, for the reason that the strain on her productive power is too great, and unless she is very carefully handled, it will be found that she will weaken, and that her progeny will suffer as a result. However, in cases where the sow, through accident, loses most of her suckers, or all of them, or in cases where a sow produces only a very small litter, it might pay to mate her as early as possible, but under normal conditions this procedure is not advisable at all, for far better results will accrue where the sow is first allowed to wean her suckers before being mated again.

(3) *Re* feeding sows carrying young and ditto after farrowing. Is it advisable to feed green corn cobs? Are they a suitable food for sows within, say, six weeks of farrowing or immediately after farrowing? This when the cobs are fully developed, but when the grain is in the "doughy" stage and some still "milky," the sows have pumpkins, mangels, and separated milk three times daily.

Answer.—First of all, be well advised not to feed your breeding sows too heavily at this particular stage, for over-feeding is disastrous to both sow and suckers. Sows that are receiving separated milk three times daily with pumpkins and mangels *ad lib* should not require corn, either in the form mentioned or in the form of grain. Sows close to farrowing and sows that have already farrowed should for two or three days before and for ten days after be placed on a much reduced ration as far as quantity is concerned, though they should not be starved. There is nothing objectionable or injurious in the use of green corn cobs, except that they would tend to induce a heavy flow of milk, and this would be of more advantage when the suckers were three or four weeks old than immediately after birth, for until the suckers are ten days old or so, they do not require heavy feeding, and it is better to have the sow anxious for food and hungry, then it is to have her suffering from milk fever or affections of the mammery glands and udders. This latter will frequently happen where the sow is overfed, and many suckers are lost at this stage as a result of over-feeding. Careful attention to the feeding of the sow is urged if it is hoped to secure payable results. It is equally necessary that the sow's bowels should be kept in good order, for constipation is a common cause of trouble at this time when the sow will be somewhat lethargic and feverish. It would pay you to study the whole subject carefully, and if we can assist by sending further information, please advise.

The Duroc-Jersey-Berkshire Cross.

J.W. (Yuruga)—

Mr. Shelton advises:—The Duroc-Jersey boar crossed with Berkshire sows should produce excellent quality bacon pigs. Some pigs of this cross were recently marketed by Messrs. Brown Brothers, of Toogoolawah, and on being slaughtered at the Murarrie Factory were reported on as of excellent quality and type. We are now arranging with Brown Brothers to notify us when the next batch of crossbred pigs come forward, so that further photographs may be secured and all weights recorded. This information will be published in the Journal in due course with the illustrations. We can recommend the cross, though if it were possible to secure a boar and sow unrelated of the Duroc-Jersey breed, we think it would pay you to breed a few purebred pigs, for there is a growing demand for boars and sows in this breed, and you would find neighbours willing to purchase from you if you offered the pigs at a reasonable price. We have asked Mr. R. G. Watson, stud stock salesman, of Inns of Court, Adelaide street, Brisbane, to quote you for Duroc-Jerseys as well as Berkshires, so that you would know just what stock were offering.

White Scour in Sucking Pigs.

A Peerampn correspondent writes:—

"I have a sow with a litter of pigs two weeks old; during the last few days they have contracted a white scour. Several have died and the others seem likely to follow.

"Could you tell me the cause of this, and if you know any remedy? The sow is on her first litter, and seems in the best of health. I have put her on sweet milk with a little sulphur in it. She was fed with separated milk previously, and had no other feed."

The Instructor in Pig Raising (Mr. E. J. Shelton) advises:—It is quite evident that the cause of the white scour (diarrhoea) in your young pigs has been that you have been feeding the sow too liberally on rich foods, either prior to or at farrowing time, as well as during succeeding days. Feeding the sow heavily at this time causes her to develop a heavy flow of milk, and as the suckers obtain more than they can properly digest, indigestion is set up. This quickly tends to disorders of the bowels, diarrhoea or profuse white scour is set up, and this leading to severe inflammation usually terminates fatally unless the disease is caught in time.

Much the same conditions result when sows are fed on mouldy, musty, or decomposed foods, or if the sow and suckers are exposed to harsh weather conditions—viz., wet and cold, damp sleeping places, &c., but the commonest cause of it all lies in overfeeding and, of course, the remedy first lies in reducing the amount of food by more than half, compelling the sow and litter to take liberal exercise, and keeping both sow and suckers in a clean, well-ventilated, dry pen, or, preferably, in a roomy yard in which there is a good shelter shed. It is somewhat difficult to say just what amount of feed a sow should have at this time, but you would be able to judge what her ordinary ration has been, and would know just how much to "cut out" for the time. If the suckers do not improve, give them each a dessertspoonful of castor oil (neat), and follow this with a tablespoonful or two of warm milk or water. If they appear to be suffering pain, add a few drops of chlorodine or a drop or two of laudanum, but this is not usually necessary where the castor oil can be given to the pigs.

It will be necessary, of course, to see that the sow has a liberal supply of green food, lucerne, &c., but she should not be fed too liberally until the suckers are about one month old, then she should come back to the ordinary ration, and rather more than this if she has a thrifty litter. Treatment is almost entirely a preventive one, and must aim at avoiding the disease altogether by keeping the pigs in the best of condition, and giving special consideration to feeding the sow and litter. Any further information will be gladly supplied.

Farm and Garden Notes for April.

Field.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April:—Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

In those areas where seasonable rainfall permitted the planting of potatoes, these should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and, where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—*i.e.*, those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

Kitchen Garden.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally, except cucumbers, marrows, and pumpkins. In connection with these crops, growers are recommended to adopt some form of seed selection for the purpose of improving the quality of vegetables grown by them. Just at present, selections should be made from all members of the cucurbitaceæ (pumpkins, cucumbers, &c.). Tomatoes should also be selected for seed. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as speeking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that speeking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing speeking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for speeking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and speeking follows in due course.

The remedy for speeking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus becomes toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of speeking or injury from fruitflies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruitflies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Strawberries can still be planted, and the earlier plantings must be kept well worked and free from all weeds in order to get a good crop of early fruit.

Scrub land intended for bananas can be felled now, as there will be little more growth, and it will have ample time to dry off properly in time for an early spring burn. Do not rush scrub falling, as it is work that pays for extra care. Lopping will improve prospects of a successful fire.

Keep a keen lookout for fruit flies, and on no account allow any fallen fruit of any kind to lie about on the ground unless you are looking for trouble with the ripening citrus crop. Keep the fly in check, and there will not be any very serious losses; neglect it, and there will not be much fruit to market.

The advice given with respect to the handling and marketing of citrus fruit applies equally to custard apples, pineapples, bananas, and other fruits. In the case of bananas handled by the Committee of Direction of Fruit Marketing, grading is now compulsory, and it will undoubtedly tend to stabilise the market for this fruit.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Practically the whole of the fruit crop will have been gathered by the end of March, but several of the later ripening varieties of apples grown in the Granite Belt may be kept for a considerable time, provided they are free from fly or other pests and are stored under proper conditions. Varieties such as Jonathan can be kept for some months at a temperature of 31 to 32 deg., and later varieties, such as Granny Smith and Sturmer can be kept till apples come again if stored at the same temperature. At the same time, although storing the fruit at this temperature under artificial conditions enables them to be kept for many months, the fruit can be kept for a considerable period, and marketed from time to time as desired, by storing it in a specially constructed apple-house in or adjacent to the orchard where grown.

Such a store can be cheaply constructed in the side of a hill out of the soil of the district and slabs of timber. The soil will make excellent pisé for walls, and the roof may be constructed of slabs covered with soil. Such a store can be kept at a very even temperature, and if the air is changed during cool nights—not frosty nights—the temperature can be reduced to a low point—low enough to keep the fruit in good condition for many weeks.

All orchards and vineyards not already cleaned up must be put in order, and all weeds destroyed. Keep the surface of the soil stirred so as to give birds and insects a chance to get at any fruit fly pupæ, as it is necessary to destroy this pest whenever there is a chance of doing so.

Land intended for planting during the coming season should be got ready in order to expose the soil to the cold of winter, thus rendering it sweeter and more friable.

If there is any slack time in the course of the month, go over all surface and cut-off drains and put them in good order. Also, if during periods of heavy rain, soft or boggy spots have made their appearance in the orchard, do what draining is necessary, as badly drained land is not profitable orchard land, and the sooner it is drained the better for the trees growing upon it. Soft or boggy spots are frequently caused by seepage of water from a higher level. In this case a cut-off drain will be all that is necessary, but where the bad drainage is due to hard pan or an impervious subsoil, then underground drains must be put in. After draining, the land should be limed. Liming can be done now and during the following three months, as autumn and winter are the best times to apply this material.

When the orchard soil is deficient in organic matter (humus) and nitrogen, try the effect of green-crop manuring, planting the grey or partridge pea and manuring the ground for this crop with a good dressing of finely ground island phosphate or basic phosphate.

Where citrus fruits are grown, they should now be ready for marketing. If the land needs it, it should be given an irrigation, but unless the trees are suffering from want of water it is better to stick to the use of the cultivator, as too much water injures the keeping and carrying qualities of the fruit.

The remarks on the handling and packing of citrus fruits in the coast districts apply to the inland districts also, but these districts have an advantage over the coast in that, owing to the drier atmosphere, the skin of the fruit is tougher and thinner and in consequence the fruit carries better.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	MARCH.		APRIL.		MOONRISE. MAR.	APR.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5·44	6·24	6·1	5·50	a.m. 11·18	p.m. 12·33
2	5·45	6·23	6·2	5·49	p.m. 12·11	1·23
3	5·46	6·22	6·2	5·48	1·2	2·8
4	5·46	6·21	6·3	5·47	1·54	2·51
5	5·47	6·20	6·3	5·46	2·43	3·30
6	5·48	6·19	6·4	5·45	3·29	4·9
7	5·48	6·18	6·4	5·44	4·14	4·47
8	5·49	6 17	6·5	5·43	4·55	5·22
9	5·49	6·16	6·5	5·42	5·34	6·0
10	5·50	6·15	6 6	5·41	6·12	6·41
11	5·50	6·14	6·6	5·39	6·51	7·25
12	5·51	6·13	6·7	5·38	7·27	8·12
13	5·52	6·11	6·7	5·37	8·5	9·3
14	5·52	6 10	6 8	5·36	8·45	9 58
15	5 53	6·9	6 8	5·35	9·29	10 58
16	5·53	6 8	6·9	5·34	10 17	11·59
17	5·54	6 7	6·10	5·33	11·7	... a.m.
18	5·54	6 6	6·10	5·33	... a.m.	1·1
19	5·55	6·5	6·11	5·32	12 3	2·3
20	5·55	6·4	6·11	5·31	1·2	3·4
21	5·56	6 3	6·12	5·30	2·6	4·3
22	5·56	6·1	6·12	5·29	3·8	5 0
23	5·57	6·0	6·13	5·28	4·13	5 58
24	5·57	5·59	6·13	5·26	5·13	6·55
25	5·58	5·58	6·14	5·25	6·15	7·48
26	5·58	5·57	6·14	5·25	7·13	8·43
27	5·59	5·56	6·15	5 24	8·9	9·36
28	5·59	5·55	6·16	5·23	9·5	10·28
29	6·0	5·54	6·16	5 22	9·59	11·18
30	6·0	5·52	6·17	5·21	10·47	p.m. 12·4
31	6·1	5·51	...	...	11·42	...

Phases of the Moon, Occulations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

2 Mar.	☾ First Quarter	10 7	a.m.
11 ,,	○ Full Moon	12 21	a.m.
18 ,,	☽ Last Quarter	3 21	a.m.
25 ,,	● New Moon	12 3	a.m.

Apogee on the 4th March, at 11 36 p.m.
Perigee, on the 20th March, at 10 54 a.m.

The sun will pass to the Northern side of the equator on March 21st when the Equinox will occur, thus dividing the twenty-four hours equally between day and night.

THE PLANETS.

Mercury will be in superior conjunction with the sun on the 5th at 11 0 p.m.: that is, it will be on the farthest side of its orbit beyond the sun, when it will be quite unobservable.

Saturn will be in conjunction with the moon a little after midnight on the 14th, when both will be high up in the sky towards the N.W. Saturn will then be at a distance of about five diameters of the moon from it towards the South. Mercury will be at its greatest elongation east of the sun soon after idnight on the 30th.

1 April	☾ First Quarter	6 8	p.m.
9 ,,	○ Full Moon	1 33	p.m
16 ,,	☽ Last Quarter	9 40	a.m.
23 ,,	● New Moon	12 28	p.m.

Apogee, 1st April at 7 48 p.m. and on the 29th ,, at 3 0 p.m.
Perigee, 14th ,, at 8 12 a.m.

THE PLANETS.

Venus will be in superior conjunction with the sun, that is on the far side of its orbit beyond the sun, and nearly in a line with it on the 23rd at 9 a.m. It will therefore be lost to sight during the greater part of this month.

Mars will be getting lower down towards the west when the sun sets and will become invisible by eight o'clock soon after the early part of the month.

Jupiter will not rise until near midnight on the 1st, but about 10·50 p.m. on the 15th. It will be in conjunction with the moon on the 16th at 3·27 a.m. and should form an interesting spectacle in the northern sky.

Saturn will be in conjunction with the moon at 5·15 a.m. on the 11th, Saturn being at a distance of about five times the diameter of the moon from it when both are low down towards the west.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

In view of the revived interest in the manufacture of power alcohol a paper by Mr. Pollock on the Cassava plant is especially useful. Mr. Pollock also discusses fodder conservation very fully. The production of new varieties of wheat suitable to Queensland conditions is described by Mr. Quodling. The suitability of the Central Coast for sheep raising is the subject of a short report by Mr. Brown. Mr. Shelton contributes a paper on pig clubs for scholars in addition to other valuable notes. The display of Queensland produce at the British Empire Exhibition is described by Mr. Mobsby in a brief interview. Turkey raising is Mr. Rumball's subject this month. An excellent paper on banana packing and grading by the late Mr. W. Rowlands is a special feature of this issue. Among reprinted matter is a notable article by Mr. E. G. Theodore on white settlement in the Australian tropics. The April Journal is excellently illustrated and, generally, readers will find it very acceptable.

Power Alcohol.

The possibility of establishing a power alcohol industry in Queensland is claiming the close attention of the Government. The matter though really one of Federal concern is of particular interest to Queensland, as it is believed that this State possesses greater advantage as a field for raw material than any other in the

Commonwealth. Discussing the matter recently with representatives of the Press the Minister for Agriculture and Stock (Hon. W. Forgan Smith) pointed out that Australia at the present time is practically dependent on outside sources for supplies of lighter oils which are suitable for use in internal combustion engines, and it is significant that the Commonwealth requirements in oils of such character show a material increase from year to year. It would be a splendid thing for Queensland if a means could be devised which would permit of this State contributing a substantial percentage of the total complement of lighter oils consumed annually.

The question of the production of power alcohol has gained in prominence in many countries since the termination of the war, and the subject was discussed by Mr. Theodore when in Great Britain last year with representatives of the International Sugar and Alcohol Company, Limited. This company is seriously considering the matter of co-operating with the Plane Creek Central Mill with the object of erecting a power alcohol factory at Sarina, and to assist in the project the Government is prepared to advance by way of a loan to the Plane Creek Central Mill the sum of £25,000.

Experiments to determine the efficiency of power alcohol as a substitute for motor spirit have been made, and results show that power alcohol is satisfactory for practically all purposes for which motor spirits are now being used. The companies concerned in the building of the factory at Sarina anticipate that they could have the premises in readiness to commence operations by March of next year. It is proposed to treat molasses from the mill for power alcohol, and as a further source of raw material it was proposed to plant 300 acres with Cassava. Cassava, Mr. Smith pointed out, is not widely grown in Queensland or in any of the States of the Commonwealth at the present time. The Dutch in Java hold pride of place as cultivators of the plant and it has been decided to send Mr. G. B. Brooks, Instructor in Agriculture of this Department, to Java to make a full inquiry into Cassava cultivation.

Cassava Cultivation.

About twenty years ago Cassava was grown at the Mackay Experiment Station and yielded from 12 to 15 tons per acre. Forms of plant life which have a comparatively high starch content are most suitable for alcohol extraction, and experiments are about to be made by this department with the object of determining what other kinds of plant life may be suitable as a source of raw material in power alcohol production. It is estimated that Cassava will crop from 8 to 12 tons per acre, and that 1 ton of it will produce 39 gallons of alcohol. On the other hand, 1 ton of sugar-cane will produce 23 gallons of power alcohol, but the former may be grown more cheaply.

Commonwealth Petrol Consumption.

The estimated consumption in the Commonwealth of petrol for power alcohol purposes is 42,000,000 gallons yearly, and that 65,000,000 gallons will be required for next year. These figures indicate the very rapid rate at which power alcohol requirements are increasing. The entire molasses yield from the 1925-26 crop will produce not more than 7,200,000 gallons of 95 per cent. alcohol, or about 17 per cent. of the total present requirements. These figures illustrate that there is a wide field offering for the development of the manufacture of industrial or power alcohol.

THE HON. W. N. GILLIES, STATE PREMIER.

A pioneer son of pioneer parents, and in every sense a big Australian, is the first farmer Premier of Queensland, Mr. William Neal Gillies.

Coming from Scotland his parents settled on the land in the Hunter River district of New South Wales, and it was there that Mr. Gillies was born. When a lad of thirteen his parents trekked northward to the Richmond River, and soon after the resourceful young Australian, who was destined to achieve distinction in

Hon. W. N. Gillies,

who has succeeded the Hon. E. G. Theodore as Premier of Queensland.

the service of the people, started farming for himself. At sixteen he was managing a local creamery and, later, filling the role of postmaster. Sticking to the land he engaged in sugar-growing. It was the day of indentured coloured labour from the South Seas, and from his father, who was the originator of the Anti-Alien League of New South Wales, which had for its aim the abolition of kanaka labour in the

sugar industry, young Gillies absorbed his democratic ideas and faith in the national ideal of White Australia. Following a strong paternal lead Mr. Gillies became, later, president of the New South Wales Sugar Defence League, an outgrowth of the earlier successful organisation founded by his father, a position which he retained until 1911.

The present generation has, perhaps, very little appreciation of the strenuous efforts of the farmers of that time to make and maintain sugar-growing as a white man's industry. The fine national spirit, strength of character and foresight of these hard fighting farmers on the Northern Rivers were big factors in forcing a general acceptance of the Australian Monroe Doctrine, which, to-day, is the nation's slogan.

Attracted to the new and fertile lands of the North, Mr. Gillies came to Queensland in 1911 and settled on virgin scrub country on the Atherton Tableland, a region rivalling in richness the Big Scrub of his native State. As a leader among the new settlers and workers his worth was quickly recognised and, within a year of his driving in his tent pegs on his new selection, they sent him down to Brisbane to represent them in the Parliament of the State. As representative of Eacham he has sat ever since, each following election securing his tenure by increasing majorities. In 1916 the Public Works Commission was appointed with Mr. Gillies as its first chairman. The Brisbane-Kyogle Railway proposal, the building of which Mr. Gillies advocated on both sides of the border—an effective advocacy to which is largely due the present practical stage of the project—was the subject of the Commission's first inquiry. In 1918 Mr. Gillies entered the State Cabinet as Assistant Minister for Justice, and in the following year attained full Ministerial rank as holder of that portfolio. When Mr. William Lennon was appointed Lieutenant-Governor, Mr. Gillies succeeded him as Minister for Agriculture and Stock. In 1921 he was chosen by his colleagues to fill the chair of Deputy Premier when Mr. E. G. Theodore assumed the Premiership in succession to the late Mr. T. J. Ryan, K.C.

Agriculture is still Australia's basic industry and agricultural prosperity is of vital importance to the country and it was, seemingly, with these ideas in view that Mr. Gillies, both as Deputy Premier and Minister for Agriculture and Stock, performed such notable service to the industry in State and Federal Councils. The country cannot thrive without a prosperous rural population—a prosperity based on better business, better farming, and better living. Increase of population in rural areas; need for improvement in the business organisation of agriculture; definite improvement in the marketing of farm products; application of economical methods of marketing enabling farmers to sell and buy on more equitable terms; promotion of progress in production and prevention of waste due to animal and plant diseases by education, research, and legislation; provision of advisory officers both in new and established rural industries; capital provision for settlers' current needs; general stabilisation of farming; encouragement of arable farming; better methods of cultivation; improvement of live stock breeds—all these ideas were crystallised in measures introduced and piloted through Parliament by Mr. Gillies in the course of a record term as Minister for Agriculture and Stock, a period of legislative and administrative activity and achievement that in Australia, it may be fairly said, has no parallel.

On his entry into the Agriculture Office Mr. Gillies found twenty-two Acts of Parliament to administer. In the course of his Ministerial term he had seven of these amended or consolidated and added fourteen new agricultural and related measures. The whole period was marked by phenomenal departmental activity.

The establishment of the cotton industry, stabilisation of the sugar and other farming industries, systematic agricultural organisation, formation of wheat and other pools, the placing of the farmers' co-operative movement on a sound basis, the protection of banana growing and its preservation as a white man's industry, the Sugar Agreement with the Commonwealth—all required special legislation or regulation, and in these enactments the general benefit of agriculture, and therefore of the nation, was the basic idea. The administrative acts of Mr. Gillies during

this period also covered a very wide field. Among other practical measures the system of advances to settlers was liberalised, schemes for grain and fodder conservation were initiated, native birds and animals were more closely protected, the scientific services of the department were extended, and publicity in respect to rural enterprises, conditions and problems by motion pictures and otherwise was greatly improved. Behind it all Mr. Gillies was the driving force, a force expressive of uncommon ability, courage, pertinacity, and vast energy, a force encased in a sound practical knowledge of agriculture and the economic and other problems, in all their complexity and perplexity, that confront the industry.

HON. W. FORGAN SMITH, SECRETARY FOR AGRICULTURE AND STOCK.

Mr. Forgan Smith was born at Mynlefield House, Invergowrie, Perthshire, Scotland, in 1887. He is the youngest member of the Queensland Cabinet. He was educated at Dunoon Grammar School, Argyleshire. In 1915 Mr. Smith entered Parliament as member for Mackay, and has held that seat ever since. In 1918 he was appointed Chairman of Committees, and in 1920 he entered the Cabinet as

Hon. W. Forgan Smith,
who has succeeded the Hon. W. N. Gillies as Secretary for Agriculture and Stock.

Minister for Public Works. Mr. Smith, who has often acted as Minister for Agriculture and Stock, brings to his new office an intimate knowledge of the agricultural industry and its economic problems. The sugar industry particularly has been to him a subject of close study, and the present satisfactory position of canegrowing is due in a large measure to his strong advocacy. In the creation of Cane Prices Boards he took a leading part, and as representative of Queensland he, with foresight and forcefulness, helped materially in the negotiations that culminated in the Commonwealth Sugar Agreement.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Entomologist at Meringa, Mr. Edmund Jarvis, has submitted the following report to the Director of Sugar Experiment Stations, embracing the period December to January, 1924-25:—

Fumigating Cane Grubs.

As pointed out in my last monthly report, the time has now arrived for treatment of grub-infested areas with carbon bisulphide or paradichlor., the relative merits of which have already been fully discussed in previous reports.

Apparently very few growers are inclined to take any action this season with regard to control measures, being, in fact, perfectly willing to rely on the activities of various natural enemies to keep this cane pest in subjection and ensure them profitable returns. Certainly, the vigorous and healthy green appearance of most of the cane at present would seem to justify such optimism, but we must remember that this luxuriant growth is due very largely to the occurrence of generous rains experienced last month.

One does not usually notice much sign of the presence of our insidious cane-grub until the end of February or beginning of March, at which time, unfortunately, it is too late to combat its ravages.

Arrangements are being made, however, to help growers who may be interested enough in this matter to wish to fumigate small areas of caneland likely to be grub-infested this season; the secretary of the Cairns Canegrowers' Association having been kind enough to assist us again in this useful branch of experiment work.

We are hoping to be able to treat plots of from 1 to 2 acres with paradichlor., and also to test, in field practise, the influence of calcium cyanide on grubs of the grey-back cockchafer (*Lepidoderma albohirtum* Waterh.).

This latter fumigant will consist of the flaked form, and is to be applied by means of a hand injector. Upon coming into contact with moisture in the soil, fumes of hydrocyanic acid gas are at once liberated, such fumigation being maintained from the flakes injected for about twenty-four hours, allowing time for this gas to penetrate sufficiently to kill all grubs located within a radius of about 9 inches from points of injection.

The cost of such application (allowing for a maximum dosage of one scruple of the poison to each injection) works out at about £3 7s. per acre for material and application.

Growers wishing to use carbon bisulphide should lose no time in procuring supplies of this insecticide, so as to be in readiness to seize the opportune moment or crucial time for injecting same, when the soil happens to be in just the right condition for successful fumigation. During the past two weeks (26th December to 9th January) the ground has been in capital state for treatment with either paradichlor. or carbon bisulphide; and although at present (12th January) wet weather has again supervened, we may still be fortunate enough to get another week or two suitable for this work towards the end of January or beginning of February.

Natural Enemies of Cane-grubs.

Possibly our canegrowers may be interested to learn somewhat about the complex natural factors that serve to control the undue increase of cane-beetles; and which, were it not for the interference of man, would inevitably prevent this species from ever multiplying to an injurious degree.

Firstly, those of primary importance in this connection are brought about by the occurrence of abnormal meteorological conditions, such as prolonged droughts, heat waves, unseasonable excessive wet, &c., acting either independently or in association.

The comparative scarcity of cane-beetles during the last couple of years must, for example, be attributed to the operation of this phase of natural control. A very similar climatological check took place also in the year 1915-16, from which decided setback the cane-beetles did not fully recover until 1919.

At such times this cockchafer sometimes perishes literally in millions, cheeks of such nature being often felt over an area of perhaps a thousand square miles.

Secondly, the part played by certain native animals and birds helps to thin the ranks of the enemy very materially.

Amongst these controlling agents may be mentioned species of the genera Perameles, Phascologale, Petaurus, &c.; together with a dozen or more species of birds.

Equally important, perhaps, are some of the lower forms of animal life, including such enemies as predaceous centipedes, beetles, &c., and various hymenopterous and dipterous parasites, which attack both the grub and beetle condition of this pest. Among such are included our well-known digger-wasps of the genera *Campsomeris scolia, Discolia*, &c., two or more common species of Asilidæ; one or two of Elateridæ; and several species of tachinid and dexiid fly parasites.

Lastly, an appreciable percentage of grubs of *albohirtum* and *frenchi*, our two most formidable cane-beetles, are annually destroyed by fungus and bacterial diseases.

Chrysomelid Attacking Cane.

Since recording last month the occurrence of *Rhyparida morosa* from three different sugar-growing centres, we have just bred another species of Chrysomelidæ from larvæ lately collected by Mr. G. Bates at Proserpine. This little beetle has not, so far as I am aware, previously figured as a cane pest, so may be considered as another addition to our list of insects attacking this crop.

It is slightly smaller than *morosa*, being less than a quarter of an inch in length, from which it differs also in being yellowish brown, with more prominent eyes, outer edges of pronotum rounded, and elytra more coarsely punctulate. It is reported by Mr. Bates to have caused notable damage this season to young cane at Proserpine.

With regard to its activities in the future, I am inclined to think that this beetle, like *morosa*, is probably well controlled by various parasites, &c., and that any abnormal numerical increase, such as that noticed for the first time this season, is very likely due to some unusual occurrence of influence affecting the economy of certain natural enemies of this insect.

Opossum Eating Cane-beetles.

In connection with the subject of natural enemies of our cane-beetles, it may be of interest to record that beetles of both *albohirtum* (grey-back) and *frenchi* are caught and greedily devoured by the "Lesser Flying Opossum (*Petaurus breviceps*). Happening to have one of these charming little animals in captivity, I have been able to make a few interesting observations respecting its dietary.

Upon capturing a grey-back beetle it is not eaten piecemeal, but merely drained of its succulent contents; the chitenous exoskeleton being afterwards rejected as an empty shell, and remaining practically unbroken. This species of opossum measures 7 inches in length of body, while the tail is about 8 inches. Owing to its extreme docility, beautiful soft fur, and lovely eyes it makes a most dainty little pet.

Controlling White Ants.

This branch of control work continues to receive consideration, our recent laboratory experiments having yielded data of more or less economic interest. Some of these results will be given in my next report. The study of remedial measures both in field and laboratory, against such insects as termites, wireworms, and root-borers might well engage the undivided attention of an Entomologist.

AN ENTOMOLOGICAL SURVEY.

An account of a visit to Proserpine and Ayr Districts, November, 1924, by Mr. G. Bates, Assistant to Mr. E. Jarvis, Entomologist at Meringa.

Proserpine.

Twenty-five farms were visited in the following areas:—Waterson, Up River, Saltwater, Preston, Strathdickie, Glen Isla, Tawvale, and Kelsey Creek.

A hundred Tachinid Flies (*Ceromasia sphenophori*) in test tubes, and a number of cane sticks containing fly pupæ, for liberation in this locality.

The beetle-borer (*Rhabdocnemis obscurus*, Boisd.) is not doing as much damage in the Proserpine district as further north, and as most of the cane was harvested there was a difficulty in finding suitable places to liberate the flies. Borers were found doing most damage in Saltwater area and were also found at Preston, Strathdickie, and Waterson.

The flies were liberated on 17th November, in a ¾-acre block of cane, mixed varieties, slightly infested with borers, on W. Drury's farm at Saltwater.

The box containing fly pupæ was established in a small block of Goru at Saltwater, about 2 miles from where the flies were liberated. There was more borer-infested cane on this farm than anywhere else, and the liberation of tachinid flies should assist greatly towards remedying the trouble.

Grubs.—The primary pest of this district is grubs of the grey-back beetle (*Lepidoderma albohirtum*, Water.). All parts of the district are subject to attacks, but most damage was observed at Kelsey Creek, then Waterson, and Strathdickie. In following the plough and digging under cane stools, several species of grubs were discovered. *Lepidiota caudata* Blackb., was found in alluvial soil at Kelsey Creek. At Strathdickie, in alluvial soil, pupæ and adults of the Christmas Beetle (*Anoplognathus boisduvali*, Boisd.) and a few grubs of an *Anoplognathus*, sp., were being ploughed out, besides pupæ and adults of the grey-back (*L. albohirtum*). Four species of scarabæidæ beetles were obtained from ploughed land, the species *Gnathaphanus pulcher*. Dej., being very common. Larvæ, pupæ, and adults of the Elephant Beetle (*Xylotrupes australicus* Thomp.) were also obtained.

At Saltwater, while following the plough, larvæ of a small Telephorid beetle under cane stools were present in large numbers. It is not known if these are responsible for injury to cane or not. Specimens were obtained and bred through to adults.

At Kelsey Creek and Waterson, the grub of a small beetle belonging to the family Chrysomelidæ, is causing a great deal of damage to young plant cane. This grub attacks the eyes of the set and the young shoot, gnawing at it and tunnelling about until the shoot dies. The cane generally strikes, but when a few inches high begins to die, and on digging up a plant these tiny white grubs are found in the soil, among the roots, and tunnelling right up the stalk. Some idea of the damage may be gathered from the fact that one grower at Kalsey Creek planted 6½ acres of 1900 Seedling and Clark's Seedling in July, and at the time of my visit, 75 per cent. of the cane was destroyed. Of another block of 7 acres planted in July, 75 per cent. was destroyed.

At Waterson one grower has had to replant 8 acres out of 18, owing to the damage caused by this grub. These grubs were particularly plentiful during August and September, when thirty or more could be found under each plant.

Emergence of Beetles.—Greybacks (*L. albohirtum*, Water.) emerged about 14th November after good falls of rain, and about a week later were very plentiful on certain feeding trees. Specimens of feeding trees were obtained. On 16th November small numbers of the Brown Beetle (*L. frenchi*) (?) were on the wing. Christmas Beetles (*A. boisduvali*) were first seen on poplar gums on 17th November, but on the 20th large numbers could be found at Strathdickie. Two other species of *Anoplognathus* were taken in company with *A. boisduvali Dasygnathus australis* Macl. was obtained from behind the plough, and several specimens came to artificial light. On 20th November *Anomala australasiæ* Blackb. were fairly plentiful, and on the 25th a large number of specimens of a small green beetle (*Colloodes rayneri*) were obtained.

Wire Worms Monocrepidius sp.—This insect, which attacks the eyes of sets, thus preventing "striking," was troublesome at Strathdickie and Tawvale last July and August.

Pentodon australis, Blackb.—This beetle was causing damage to sets last year at Preston, during September and October, but has not been in evidence this year.

Ayr.

Farms were visited in the following areas:—Airdmillan, Dick's Bank, Brandon, Klondyke, Ivanhoe, Kalamia, Plantation Creek, and Jarvisfield.

Pests.—The primary insect pests of this district are grubs of the greyback beetle (*L. albohirtum*, Water.) and the large White Ant (*Mastotermes darwiniensis* Frog.).

The grub damage this year is comparatively light, and is confined to one part of the district—*i.e.*, along the banks of Plantation Creek. Up to 3rd December there were no cane beetles on the wing.

White Ants (*Mastotermes darwiniensis* Frog.).—This insect is responsible for much damage in some parts of the district. Farms at Jarvisfield suffer most, but termites are also found at Brandon and Ayrdale, in the Pioneer Mill area. This pest is troublesome to cane from time of planting up to harvesting, eating the sets, and tunnelling up the growing stalk right to the cabbage, leaving only the rind. All dead timber, logs, &c., seem to contain these termites, and even green trees have been eaten down. One farmer at Jarvisfield is poisoning all posts and other harbours which contain white ants with a mixture of arsenic and molasses, one part of arsenic to six parts of molasses, by measure. This mixture, he says, is giving good results. Another farmer is burning all timber, logs, &c., which are infested with white ants. Some thousands of termites were collected, and brought back to Meringa for experimental purposes.

CANE DISEASES AND PESTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (20th January, 1925) from Mr. W. Cottrell-Dormer, who is investigating cane pests and diseases:—

Diseases.

The Proserpine district as a whole appears to be fairly free from serious diseases. However, Mosaic disease was present in the Kelsey Creek locality and at Cannon Valley. In the latter case it was doing very severe injury to most of the infected cane. It was probably introduced into the locality some two or three years ago, and owing to lack of knowledge it has spread rapidly on the affected farm. A great deal has been written on the subject of Mosaic disease of late, but too great a stress cannot be laid upon its nature and the conditions of its occurrence. As has often been stated, Mosaic disease is recognised in sugar-cane by the peculiar manner in which the leaves are mottled by irregular markings usually a little longer than broad, of no definite shape, and in colour a lighter green than is natural to the leaf. These markings are, as a rule, more distinct on the inner leaves of the affected stems than on the outer ones. The white bands often seen on leaves in cool weather, especially in M. 1900 Seedling and D. 1135, are not due to Mosaic nor do they bear it any resemblance. Mosaic disease is so-called since it belongs to a group of similar diseases affecting other plants, viz.: Potato Mosaic, Tobacco Mosaic, &c. Mosaic is an infectious disease, but is entirely dependent, as far as is at present known, on insects for its transmission from plant to plant. Only one insect has as yet been discovered which is capable of effecting this purpose and that is the very common little blue corn aphis. This aphis is a very prolific insect and wherever its food plants occur will breed in great numbers, the chief food plants being Johnston grass (*Sorghum halopense*), sorghum, and corn. All of these plants are subject to Sugar Cane Mosaic disease though not as much as sugar cane itself. Thus directly a grower observes Mosaic disease in his fields he should, as far as possible, destroy all Johnston grass growing in or near the field and cease planting corn or sorghum in its vicinity. So important is this step in the control of Mosaic disease that in Porto Rico, where the disease is very prevalent, a law has been passed prohibiting the growing of corn or sorghum in or near cane fields. In the outbreak at Cannon Valley this has, through lack of knowledge, been neglected, with the result that the disease has spread very rapidly. Besides the precaution just discussed, roguing of diseased plants, where these are not too numerous, and careful seed selection should always be practised. Only two stools were found infected with the disease at Kelsey Creek in the variety B.208.

Leaf Stripe disease was met with on one farm up the Proserpine River in a small block of Pompey. Only a few stools showed the disease, but these were quite numerous enough to infect many more if they were left in the field, as the fungus which is found growing on the under side of affected leaves would then mature and form spores which would soon be disseminated by wind and insects amongst the surrounding stools. All these affected stools were gathered and carefully burnt. Foot Rot disease (*Marasmius* sp. ?) occurs to a slight extent throughout the district but is not causing appreciable damage.

Insect Pests.

The most serious insect pest found actually doing damage at the time of the writer's visit is a small Coleopterous (beetle) larva or grub which eventually becomes a little light brown beetle belonging to the family Chrysomelidæ. This little grub has proved very destructive to cane planted during the months of August and late July. It occurs in very great numbers in the soil in certain parts of the district and plays havoc with sets and young shoots, causing very great percentages of misses in otherwise healthy fields of plant cane. Heavy losses have thus been suffered by many farmers in affected localities. From careful observations made in December it would seem that, at that time of the year at least, the adult beetles depend only on She Oaks for their food, the leaves of which they devour with great relish. This fact was first brought to my notice by a very observant grower at Kelsey Creek (Mr. B. G. Valmadre). It is also of practical interest to observe that the insect was only found doing damage in localities where this tree occurs. This knowledge throws open a line of direct attack against this pest should it continue to be so very serious. However, the destruction of She Oaks is not to be commended until further confirmatory observations have been made. In the meantime growers armed with injectors should be able to protect their plants with small applications of carbon bisulphide and paradichlor.

Other Pests.

In addition to the ubiquitous wallaby, which does considerable damage to cane in dry weather, it would appear that the opossum has become very troublesome in certain parts of this district, and especially in the Up River locality where growers look upon this animal as a rather serious pest.

POTASH ON RED SOILS.

The Director of Sugar Experiment Stations in Queensland (Mr. H. T. Easterby) states that remarkable results have been achieved by the use of potash upon the red soils of the Woongarra district of Bundaberg at the Sugar Experiment Station. When these soils were analysed some years ago they showed a very low percentage of available potash, in places as low as 13 lb. per acre. The use of potash was thus indicated from the chemical results, and experiments were undertaken to confirm this finding by field practice.

Experiments were laid down in which potash was the sole manure applied. The average yield from plant, first ratoon and second ratoon crops to which 300 lb. of sulphate or muriate of potash were applied amounted to 22.43 tons of cane per acre. From the plots to which no potash was applied the yield per acre was only 8.37 tons of cane, or an increased yield of 14.06 tons of cane per acre for the use of potash. The cost of the potash manure at the rate of 300 lb. per acre was only £3 per acre, while the revenue for 14 extra tons of cane would be about £31 10s.

In another series of experiments the average yield for plant, first ratoon and second ratoon crops, from the application of 300 lb. of sulphate of potash per acre was 20.29 tons of cane per acre, while the plots receiving no potash only gave an average yield per acre of 10.28 tons, showing an increase of 10.01 tons of cane for the use of potash. In this experiment, plots were also treated with 600 lb. of mixed fertilisers, containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300 lb. of superphosphate. Generally speaking, mixed fertilisers give very much better results than single elements, but in these red soils the potash is so low that the higher quantity of potash applied alone gave a more favourable result. For instane, in this case the 300 lb. of sulphate of potash applied per acre gave an increased yield of 3.14 tons of cane per acre more than where the 600 lb. of mixed fertiliser was applied.

The vital necessity for potash upon the red soils of Childers and Bundaberg has been advocated for a long time, and these experiments prove that such advocacy is warranted.

It is not contended that dressings of potash alone will always give higher results than mixed fertilisers upon the red soils, but we believe they will do so at first where the potash content is low as it is in the two districts mentioned.

On the Northern alluvial soils where the available potash is higher, potash alone would not give such an increase in yields.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Collecting Cane Grubs.

During ploughing operations collect the grubs when plentiful.

Those of the "Grey-Back" will be in the second and third stages (head ¼ in. and ⅜ in. wide), while grubs of *frenchi*—the small brown cockchafer, so common last December—are mostly in the second instar. All specimens, however, should be picked up, as grubs of the latter beetle will damage cane during September to December next. It is well to remember that collecting the grubs of cockchafer beetles is practised as a matter of course in other sugar-growing countries.

Protect Your Beneficial Insects.

Do not destroy soil-frequesting larvæ, &c., of insect friends, which are parasitic or predaceous on grubs that injure your cane. Some of the commonest of these may be easily recognised by the following brief descriptions and accompanying illustrations:—

(1) White, maggot-shaped inactive larvæ, about an inch long, which when ploughed up are often found attached to dead or dying cane-grubs. (Fig. 1.) These spin cocoons (Fig. 2) from which emerge digger-wasp parasites.

(2) Dark-brown cocoons, from ¾ to 1½ in. long, composed of silk hardened to the stiffness of paper. (Fig. 2.) These are often exposed by the plough, and contain either male or female digger-wasps. (Fig. 3.)

(3) Shining white maggots, about 1½ in. in length, but more slender than those of Fig. 1, and able to tunnel with ease through soil by meals of a pointed beak. (Fig. 4.) These predaceous larvæ of "Robber Flies" (Asilidæ) pierce and suck the life-juices of various cane-grubs.

(4) Large flattened wire-worms (Fig. 5), from 1 to 2 inches or more long, having yellowish-brown shining bodies and six small legs close to the head-end. These slippery, very active creatures remain in the ground two years or longer before transforming into beetles. They are inveterate enemies of cane-grubs, seizing them with their sharp sickle-shaped jaws and then cutting deeply into the body and greedily imbibing its succulent contents.

The Best Way to Combat Weevil-Borer.

Watch the growth of cane on river flats, which is where beetle-borers are most likely to occur; and if discovering evidence of this pest having commenced attack on the basal portion of sticks communicate at once with the entomologist at Meringa Laboratory.

Tachinid fly parasites will be released by the Sugar Bureau free of cost on areas affected by this insect, on condition that the grower will agree to leave at least a quarter of an acre of grub-infested cane uncut for these parasites to breed in. This area should be allowed to remain for about three months, and must not be burnt.

Look Out for Leaf-eating Caterpillars.

Larvæ of *Cirphis unipuncta* Haw., *Laphygma exempta*, or other noctuid moths may at any time make their appearance in plantations of maize or sugar-cane. Various remedial measures against these pests were described last month.

Termites Boring Sugar-cane.

Continue to combat this insect by means of such common-sense methods as burning infested logs or timber close to headlands. Try to locate the source of invasions in canefields, which can often be traced to infested roots, stumps, &c., either in the field or on headlands. Read the Monthly Report for this month (February to March, 1925) in which results of laboratory experimentation against *Mastotermes darwiniensis* Frogg. are described.

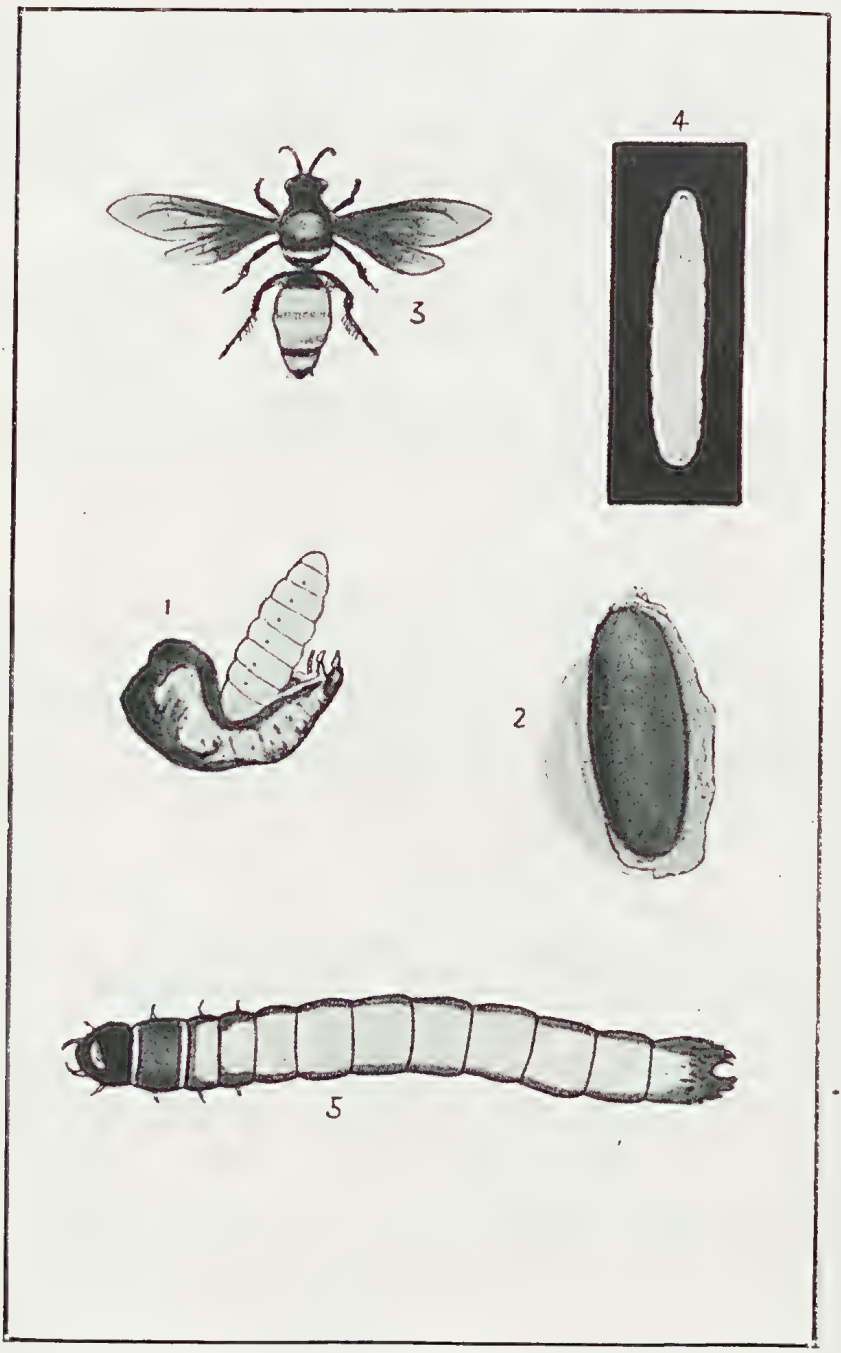


FIG. 1.—ENEMIES OF THE CANE GRUB (See Test).

Fig. 2.

CANE AT MACKAY.

On his return to Brisbane from a short visit to the Mackay and Bundaberg sugar areas, the Director of Sugar Experiment Stations (Mr. H. T. Easterby) reported that the crops were making excellent growth. At Mackay, a record season is anticipated, the present estimate being about 650,000 tons of cane for crushing. This would mean a yield of some 70,000 tons of sugar for that area. The recent hot weather had dried the soil to some extent and more rain would now do good. The Bundaberg crops had also made fine progress since last month's inspection and good rains had again recently been experienced. On the whole the crops look healthy. The cane has a fine deep green colour for the most part, and is much ahead of what is has been at this time during the past four years.

The cane at the Mackay Sugar Experiment Station presented a very fine appearance and the many experiments being carried out were attracting considerable attention. At Bundaberg, some highly interesting work is also in progress.

The annual Field Days of both these stations will be held in June.

FIELD REPORTS.

The Northern Field Assistant, Mr. E. H. Osborn, reports (*19th January*, 1925) :—

Lower Burdekin, Home Hill.

The whole district is gradually expanding and many solid new buildings were noticed, both in the town proper and also upon numerous surrounding farms. The season just finished had been a record one, 148,500 tons having gone through the rollers, but the density figures were rather under the average, particularly so in the variety, Goru. Probably the best average returns for combined weight and density were obtained by N.G. 15 (Badila), some fine crops of which had been harvested. Quite a large proportion of the ratoons were being fertilised and well worked up for next season.

One particularly heavy crop of N.G. 15, second ratoons, manured with some 4 cwt. of meatworks, and belonging to Mr. H. V. Hansen, gave good returns. A crop of the same variety, third ratoons, and manured with 2 cwt. of ammonia per acre, also gave a satisfactory yield. Each of these blocks is adjacent to the river.

Generally the cane seemed to be rather more forward than that on the Ayr side, and present indications point to a big crop for 1925.

Invicta Mill, Giru.

In comparing rainfall figures it is noticed that Giru's figures for the year were 60·54 inches against 48·80 inches for Ayr Post Office, whilst Mr. J. Wiseman's farm at Jarvisfield registered a modest 37·49 inches.

Naturally, the Giru cane (very little of which was irrigated) looked very well indeed. With so many good blocks of cane noticed, it was rather hard to individualise, but a block of 130 acres of early planted Badila, belonging to Messrs. Dementine and Beccaris, showed fine growth. Another fine strike of Badila was 30 acres of May plant of Mr. J. L. Humprey's, whilst a 21-acre paddock of H.Q. 426 of Mr. R. Walton's showed promise of a heavy crop. All these paddocks were very clean and well cultivated.

From many inquiries made, it seemed that very few cane beetles were observed during November or December, although good rains had fallen in each month, and it looks as if the coming season would be fairly free from grub attack, but at time of writing it is rather unwise to prophesy.

White ants are still causing trouble upon a few farms in the area, principally around Jarvisfield. Burning off the dead timber on headlands, &c., has done a lot to check them. Experiments in connection with the eradication of this pest have been engaging the Meringa Laboratory staff for some time, and it is to be hoped that they will lead to success.

Top rot in Badila is causing more loss than any other in the Burdekin area, and, unfortunately, so far no apparent means of minimising its losses seem feasible, and it certainly seems to offer ground for much further investigation. In several paddocks of young cane the loss caused through this disease was very marked.

Leaf stripe in B. 208 is scattered throughout the area, but is far more apparent in ratoons than in plant. Generally speaking, when noticed in plant crops the particular part of the paddock affected had suffered from a shortage of water. Growers cannot be too careful in seed selection with this cane for its value to the Burdekin is very large, and the greatest care should be taken that in every case none but the very best seed should be used.

B. 208, N.G. 15 (Badila), H.Q. 426 (Clark's Seedling), M. 1900, Goru, S. Singapore, and Q. 813 are about the principal canes grown, and give good returns upon particular soils. The two former have probably been the most satisfactory during the past season, although some very high density returns were also obtained from H.Q. 426.

Q. 813 has also given some excellent returns, both for tonnage and density, and justified the reputation that it has for being a quick striker and grower, combined with high density, in poor to medium soils. In rich soils it is inclined to grow too rank. E.K. 28 has been planted out in small quantities by many growers, and the ensuing season should give a fair idea of its commercial value as far as the local areas are concerned.

A very fine 4-acre block of it was noticed upon Mr. D. Ahern's Airedale farm. One watering had been given, and it looked beautifully green and healthy with a splendid top. The owner had previously used a paddock for seed purposes only, which he considers gave him a return of about 40 tons per acre.

Ingham Railway Line.

Quite a lot of very good plant cane was noticed and some very promising ratoons as well. One of the most promising crops seen was a forward paddock of H.Q. 426 and H.Q. 409 of Mr. V. Teilby's, whilst a small block of September plant H.Q. 426 of Mr. W. Goodwin's would take beating for general appearance and careful cultivation. Further up the line at Waterview, Mr. A. Holland has about 41 acres to harvest this year, 26 acres of Badila plant looking very well, whilst the ratoons also are very promising.

This grower has just completed building a very solid traffic and tramway bridge, 71 feet in length, over Station Creek. Three-quarters of a mile of permanent tramline are being laid down from the railway siding at Yuruga to here, whilst probably another mile of field rails will be required to harvest all the crop.

H.Q. 426 and N.G. 15 are the principal canes grown, but several small lots of H.Q. 409 were also noticed. Q. 813 was seen to be growing upon Mr. H. F. Heck's farm at Bambaroo and showed remarkably fine growth. H. 146, E.K. 1, and E.K. 28 were also being tried out here. Of these canes Q. 813 should grow very well upon many farms. H.Q. 409 was also grown in small lots last year, and gave satisfaction with its tonnage and density figures; moreover, in both early and late plantings it had given a fair strike. N.G. 15 (Badila) grows very well upon the better class of soil adjacent to the creeks and watercourses. Some very heavy crops of this were cut last year.

Wallabies cause the most damage. White ants upon a couple of farms caused minor losses, the large amount of dead timber adjacent to many of the headlands forming a natural breeding ground for them.

In travelling around this particular part of the district it is really surprising to see the progress that has been made since the Giru Mill started to take cane from

here. Last season some sixty-seven suppliers forwarded cane, whilst there are probably another thirty who have planted or want to plant cane for this factory. The majority are married, and are nearly all of British stock. Neat homes and carefully cultivated cane paddocks show that, given a chance to dispose of their cane, a fine type of agriculturist is permanently settled upon the land, and this is what is urgently wanted in North Queensland.

For comparison the following rainfall figures are interesting:—

Month.	Rollingstone.	Bambaroo.	Ingham.
	Inches.	Inches.	Inches.
January	7·99	10·18	7·39
February	9·35	9·02	11·73
March	21·31	13·97	15·11
April	6·89	2·39	9·77
May	..	..	·79
June	·73	·55	1·20
July	·01	·14	·50
August	5·20	4·64	5·61
September	1·92	1·38	1·84
October	1·00	1·90	1·75
November	4·09	5·00	2·99
December	5·67	5·08	6·82
	65·06	54·25	65·50

The Southern Field Assistant, Mr. J. C. Murray, reports (28th January, 1925):—

Bucca.

Conditions at this centre are very promising for next crushing. Soils were saturated, and the cane, plant and ratoon, was growing vigorously. Growers have had a good season.

Cane varieties looking well at Bucca are H.Q. 285, M. 189, Q. 813, M. 1900 Seedling, and D. 1135. Farmers are recommended to experiment with Q. 1098 and E.K. 28, although the three best canes at present in Southern Queensland are Q. 813, M. 1900 Seedling, and H.Q. 285. Some growers may consider this statement debatable, but in judging a cane all the features that go to make a variety a planting success should be considered.

Losses are reported from Mosaic (Yellow Stripe disease) and "Leaf Stripe disease" (*Schlerospora sacchari*). The latter is recognised by the stripes being almost as long as the leaf, with a downy mildew underneath the leaf. Mosaic is now well enough known not to need a further description. Growers are advised to note carefully the above distinction. In both cases careful plant selection and the eradication of affected plants is necessary.

Gin Gin.

There is every promise of a good yield next season. Here, as elsewhere, the farmers have had good rain. The soil is full of water and creeks and springs are running strongly. The cultivation is good on the whole, but greater use could be made of soil improving agents such as lime, especially on the heavy loams round Drinan's Siding. It is noticeable that where lime is used there is always a far less "foot rot," than where the soil is of bad texture and untreated. It is generally advisable to use green manures and lime in combination.

Mosaic was showing in places. The usual methods of eradication are recommended. The variety M. 1900 Seedling was showing a disease in places that the writer could not identify, but the following is a description:—

The shoots are short and stunted and the cane is absolutely unable to grow.

Fibre bundles in cane coloured red.

Heavy growth of adventitious roots from the nodes.

Trash adhesive.

If the disease persists the farmers are advised to destroy affected stools and bring plants from high, well drained soil.

Goodwood.

The growers here are busy keeping down the prolific weed growth induced by the heavy rain. The cane is growing well and the next season should be a good one. Considerable use is being made of green manures and fertilisers, sulphate of potash and bonemeal mixed giving good results in the latter respect. Young Brothers are growing green manure crops fairly extensively, a factor which should increase fertility and minimise erosion on these slopes.

Cane varieties making a good showing here are Q. 855, Q. 813, M. 1900 Seedling, H.Q. 285, and D. 1135. Of these, the firstnamed looks very promising and is a variety that the farmers could extend.

Growers should watch keenly for Leaf Stripe. This is affecting a considerable number of stools at Goodwood, and these should be immediately eradicated.

Portions of the cane cut on the Goodwood area this season have not ratooned well, and some stools refused to "come away" at all. An examination of the latter showed a red rot, due to a fungus parasite, in the flesh of the cane underground, and the writer attributed the poor ratooning to this cause. The damage done is unimportant, but where cane does not ratoon for an explicable reason farmers are advised to rest the area and invigorate with a leguminous crop before re-planting.

Childers.

Grubs are causing considerable loss in portions of the Childers district, particularly South Isis. The active feeding period ranges from October to May, that is, with reference to the larvæ. Farmers are recommended during this period to cultivate as much as possible and try injections of carbon bisulphide. They are also recommended not to remove the remains of any grubs that have been attacked by the muscadine fungus. When grubs are bad, the working into the soil of cane trash is a good measure. Farmers are advised to submit specimens of beetles that are flying about the lights, and obtain particulars of their life cycles, depredations, &c., from Mr. Jarvis, the Entomologist to the Bureau of Sugar Experiment Stations at Meringa, viâ Cairns.

Varieties making a good showing are H.Q. 285, Q. 813, M. 55, 7 R 428 (Pompey), Badila, and M.1900 Seedling. D. 1135 is looking well in places, but "gumming" is spreading in this variety. The first named is looking remarkably well. This cane was first introduced to the Isis district about 1913, but its value was not recognised until recently.

A considerable amount of fertilisation is being done in this area. Good results from bonedust are being obtained. It is inadvisable to place more than a small amount in the drills at planting. The bulk should be applied in the interspace about a foot away from the cane when it is about 18 inches high. This prevents the roots from bunching round the plants by encouraging the lateral feeders to reach out, thus spreading the root system, and rendering the cane less vulnerable to grub attack.

Fungoid parasites are active, causing losses on a small scale on the older soils. A red rot, similar to that showing at Sarina, is appearing in the M. 1900 Seedling. Recommendations with regard to this disease appeared in last report on the Sarina district. Farmers are advised to be more careful in plant selection than at present. If necessary, the services of an officer of the Bureau are generally available to assist in the matter of disease recognition. This observation applies generally to the districts under review.

Dallarnil.

Cane is ratooning well, and the plant cane is making vigorous growth. Most of the cane land in this district is new and requires no special manurial treatment. The one weak feature about planting operations here is the presence of Mosaic disease, mostly in the old varieties, Rappoe and Striped Singapore. Both these canes are very susceptible to disease, and the farmers are recommended to take precautions against the spread of this malady. The further planting of these varieties is to be deprecated. In addition to being susceptible to disease they are not, on an average, of the same sugar value as the cane commended earlier in this report. M. 1900 Seedling is making a good showing at Dallarnil, also Q. 1098. It showed a density of 16 c.c.s. on being tested at Bundaberg Experiment Station.

The Southern Field Assistant, Mr. J. C. Murray, reports under date, 19-3-25:—

Nambour-Maroochy.

Very heavy rains have fallen in the districts since January. Weed growth is heavy, although the farmers have their cane clean by virtue of continuous chipping. Cane is rapidly growing to a heavy crop and there will inevitably be an early crushing season.

Very keen interest was shown on the part of the growers, many of whom are new to the district, in the matter of varieties, fertilization, and diseases of cane.

Several field demonstrations were carried out and well attended. Affections such as gumming, mosaic, various fungoid parasites, and sap-sucking insects (potential media of infection) were pointed out to the farmers. Varieties were discussed, there being a necessity to do more variety experiment in these districts. A cane recommended in last month's report, H.227, is growing on at least two farms in this district, and the writer advocates its cultivation as much as possible. In appearance H.227 is not unlike D.1135, having the same hardy characteristics, is a little fleshier in the leaves, and is generally thicker than D.1135. As pointed out in previous reports, it is not immune from disease, but not subject to rapid injury if attacked. Another cane making a good showing on the Maroochy River is Q.1098.

Staple varieties looking well in these districts are M.1900 and H.Q. 285. The former was, in places, showing "Red Rot" disease, caused by a fungus. Cane that had been attacked invariably showed signs of first having been bored or cracked, into which the fungus entered.

Lime is being used successfully on the river and creek soils. Growers are getting results from basic superphosphate and mixed fertilizers containing a predominance of phosphoric acid.

Farmers are recommended to submit soils to the Bureau for analysis from time to time and to take samples as follows:—Take a spade and make three or four holes about a foot deep and a foot square wherever the sample is required, first cleaning and levelling the surface, and then press the spade from top to bottom obtaining a fair sample of about 6 lb. from each hole. These samples should then be mixed thoroughly and a sample of about 8 lb. in weight selected. This should be placed in a clean bag with the name and address of the owner in with soil on a piece of cardboard. Address to the Director, Bureau of Sugar Experiment Stations, Brisbane, with a covering letter with particulars (forms may be obtained from the Bureau or from the secretary, L.P.A., or other farmers' organisations). There is nothing technical about the information required; any farmer can supply it on reading carefully the questions asked on the form. As a number of growers are quite unaware of the fact, they are informed that they may obtain literature on all matters relating to cane cultivation, varieties, fertilization, insect parasites, &c., from the Bureau.

Bundaberg.

The cane here looks green and vigorous, although ratoons are not as forward as they should be. Heavy rains have fallen. Ploughing at present is a case of making haste slowly; in fact, a farmer would do more harm than good working his team with the soil in its present condition.

Fertilizing results are at present satisfactory, especially on those blocks treated with sulphate of potash. This applies to the average red scrub soil around Bundaberg. On the poorer or partially sterile portions of the scrub soils that occur, the following mixture is recommended:—

	Per acre.
Sulphate of ammonia	150 lb.
Nitrate of soda	100 „
Sulphate of potash	150 „
Bonemeal	250 „

This is the amount to be applied per acre and the recommendation is based on the analysis of a fairly typical sample of this class of soil. The following figures show the weights, total and readily available:—

Lb. per acre, 1 ft. deep—	Total.
Nitrogen	2,067
Potash	2,434
Phosphoric acid	1,216
	Readily available.
Potash	101
Phosphoric acid	97

As can be observed from these data, these soils are poor and, in addition to fertilizing, require thorough cultivation and, where possible, green manuring.

Mosaic is at present spreading. This may be due to a noticeably large leaf-hopper infestation. M.1900 Seedling appears to be very subject to infection by insect media. Q.813, while not apparently readily infected, positively refused to grow where the disease is hereditary. This applies particularly to the older soils, where the indigenous fungi always assist disease to retard growth. With regard to this disease, however, one thing is certain, that it is possible to get plants 100 per cent. clean if the growers will always make a practice of field survey before planting. It is a very ineffective way examining each individual set, because quite a number of apparently healthy plants may be taken from an affected stool.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of February, in the Agricultural Districts, together with Total Rainfalls during February, 1925 and 1924, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1925.	Feb., 1924.
North Coast.	In.		In.	In.
Atherton	9·46	23	5·96	6·10
Cairns	15·11	42	14·93	10·43
Cardwell	16·86	52	14·01	11·77
Cooktown	13·23	48	17·89	7·07
Herberton	7·42	37	8·91	5·67
Ingham	15·56	32	15·06	11·73
Innisfail	21·87	43	27·79	15·81
Mossman	15·61	15	19·32	8·50
Townsville	11·43	53	11·96	9·54
Central Coast.				
Ayr	8·60	37	15·12	15·69
Bowen	8·49	53	20·23	15·80
Charters Towers ...	4·30	42	7·13	13·54
Mackay	11·35	53	9·55	21·19
Proserpine	10·63	21	22·13	26·14
St. Lawrence ...	7·90	53	3·50	9·95
South Coast.				
Biggenden	3·44	25	3·67	14·81
Bundaberg	5·99	41	5·96	9·85
Brisbane	6·26	74	2·78	9·26
Childers	5·68	29	3·30	16·43
Crohamhurst ...	13·85	30	7·63	7·69
Esk	5·25	37	3·84	7·00
Gayndah	3·97	53	2·20	18·05
Gympie	6·51	54	3·70	11·10
Caboolture	7·25	37	7·42	10·06
Kilkivan	4·87	45	2·08	7·83
Maryborough ...	6·44	53	4·70	10·04

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.,	No. of Years' Records.	Feb., 1925.	Feb., 1924.
South Coast—continued:	In.		In.	In.
Nambour	8·71	28	9·57	8·29
Nanango	4·17	42	1·75	6·58
Rockhampton ...	7·33	37	3·72	8·31
Woodford	8·60	37	5·95	7·16
Darling Downs.				
Dalby	2·81	54	1·87	3·37
Emu Vale	2·15	28	3·18	5·99
Jimbour	2·73	36	1·06	4·51
Miles	2·57	39	1·50	9·00
Stanthorpe ...	3·21	51	3·12	4·68
Toowoomba ...	4·24	52	2·65	7·08
Warwick	3·06	59	1·85	5·08
Maranoa.				
Roma	3·01	50	1·69	8·58
State Farms, &c.				
Bungeworgorai ...	2·34	10	1·70	7·69
Gatton College ...	2·74	25	5·92	12·06
Gindie	2·82	25	2·99	8·26
Hermitage ...	2·18	18	0·87	5·67
Kairi	8·38	10	11·58	6·79
Sugar Experiment Station, Mackay	9·95	27	9·19	21·18
Warren	3·89	10	...	5·95

Note.—The averages have been compiled from official data during the periods indicated; but the totals for February this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

GRADING, PACKING, AND HANDLING OF BANANAS.

By WILLIAM ROWLANDS, Fruit Packing and Marketing Instructor.

So many adverse reports relative to the inferior grading, packing, and handling of Queensland bananas have been broadcasted in the course of the last two years that it has been deemed absolutely necessary to place before every grower information dealing fully with the subject.

The methods described herein are the methods employed by many successful growers in Queensland who have earned a high market reputation as consistent suppliers of firm, clean, and well-packed fruit.

Bananas are grown in such large commercial quantities throughout Queensland that it is not profitable to produce or market any bananas unless they are of good eating quality. A few purchases of immature or otherwise unsatisfactory bananas may turn consumers to other fruits, consequently growers should use every effort to keep the markets free of inferior or defective products.

This article is designed to aid growers in preparing their bananas for market in such a way that they may obtain higher average returns with fewer losses.

Growers must bear in mind from the start that it is absolutely essential to grow and produce bananas of good quality if they wish to gain the confidence of consumers and retain markets.

URGENT NEED FOR BETTER GRADING AND PACKING.

It is generally agreed that the marketing troubles with which we are dealing have arisen from and are concerned with the problem of securing a steady and properly prepared output of bananas of uniform grade, quality, and appearance. It would not be very difficult to obtain these results if all the growers in Queensland produced crops of the same quality, handled them in the same way, and were both competent and willing to grade and pack them correctly; such conditions, however, rarely exist. Growers have been sending to market bananas of poor quality; fruit which they themselves would refuse to eat. If growers of this type can get their inferior fruit on to the markets they feel they have profited; but, unfortunately, that does not end the business. The wholesaler will have difficulty in disposing of the poor fruit, while the retailer will lose on it. If it reaches the housewife she will throw it away and turn to other fruits, thus decreasing the sale of further consignments. In all these cases the grower eventually loses, directly or indirectly.

Plate 1.

Three cases of well-packed Bananas as opened in Melbourne.

Should his fruit be bought on his grade marking without close inspection on the part of the buyer, he apparently has secured returns as good as those of brands quite satisfactory; but it will not be long before all buyers fight shy of his particular brand, except at a price much below the market value of fruit true to grade.

At first thought it would seem reasonable to expect agents or distributors to eliminate poor brands and refuse to handle inferior fruits, but there is, as a rule, so much competition among them that they are unable to bring about the reforms they know to be desirable.

The weaknesses in the methods now in general use, which are preventing a much needed improvement in the marketing of our bananas, argue for a more efficient system of handling, grading, packing, and inspection.

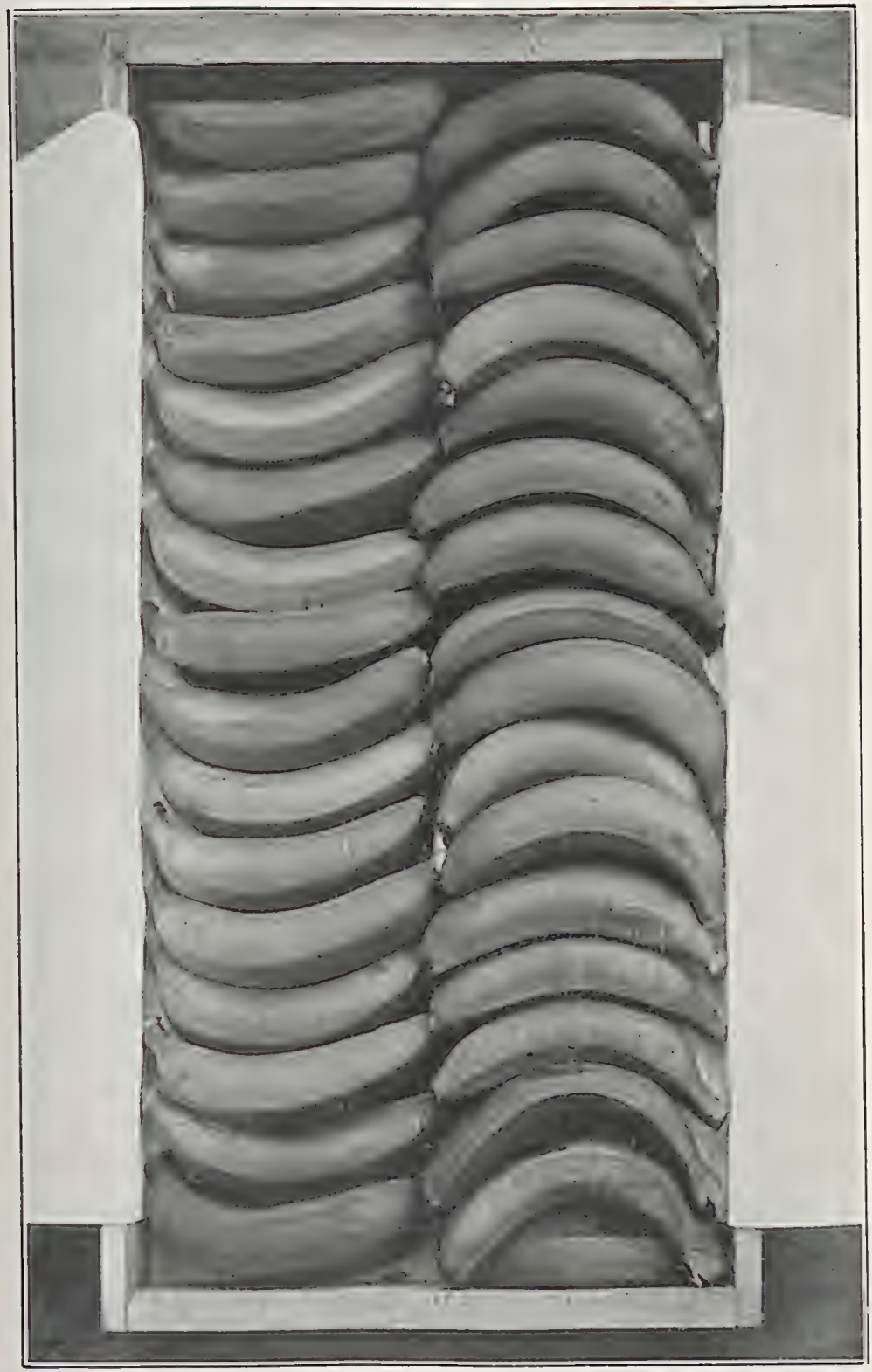
CARE IN HANDLING.

Many growers realise that care in handling during harvesting, grading, packing, and carting is necessary if they are to obtain profitable results; while others, either through ignorance or because of carelessness or indifference, subject their fruit to early decay and spoilage through needless rough handling during these operations. A great deal of rough handling is due to lack of knowledge of what constitutes careful handling. It is not generally realised that it is necessary to preserve the skin of bananas or any other fruit in a sound unbroken condition. Growers must awaken to the fact that it is their business to see that each of their harvesters, graders, packers, and carters does his share to eliminate rough handling. The writer has noticed that growers and others when carting use a full case of bananas for a seat and has also noticed cases stacked bulge side up with cases placed on top swaying to and fro from plantation to railway siding. This is a bad practice and should be avoided. Cases so ill-used may be opened by the agent to sell the whole of that particular consignment.

Mr. George Williams, Instructor in Fruit Culture, has described the Chinese method of handling in the North in the early years of the Queensland banana industry. When the industry flourished in North Queensland production was almost entirely in the hands of Chinese, who, with their usual thoroughness, gave due regard to handling. Fruit from the field was invariably carried vertically and stood on end the way in which it had grown, and so was allowed to remain long enough to allow the tissues to toughen. The yoke was commonly used to carry bunches from the plantations by the Chinese.

Among freshly cut bunches the fingers or individual fruit on being but slightly twisted from their natural alignment are more or less fractured at the connection and decay may in consequence set in.

PLATE 2.



Method of packing bottom layer of "Special."

CUTTING.

An all-important matter to be first considered is the correct time for cutting the bunch from the plant. The best judgment must be exercised in selecting bunches in the right state of maturity to carry properly. Experience on the part of growers is essential if good results are to be obtained. As a matter of fact, it is difficult to make a rule that will state just when to cut, for so much depends on such factors as locality, aspects, and seasonal conditions. Conditions that may apply in one district may not necessarily hold good in another. It is generally conceded that the bunch is ready to cut when the fruit is well-filled and rounded out instead of having an angular appearance.

In summer it can be cut when slightly less filled as the fruit will then carry better and not ripen up so rapidly in transit; but during the cooler season the fruit should be well filled before it is cut.

Much damage may be done to bananas during this operation. Many growers let the bunch fall to the ground, thereby rupturing the fruit at the stalk end. Nearly every grower has a different method of cutting the bunches from the plant. Some growers cut the bunch while an assistant prevents it from falling to the ground. This system is all right where there are two persons engaged, but where the grower is single handed the bunch should be firmly grasped by the stem, and, if heavy, it should be allowed to rest against the body so as to distribute its weight more evenly and enable it to be lowered carefully to the ground.

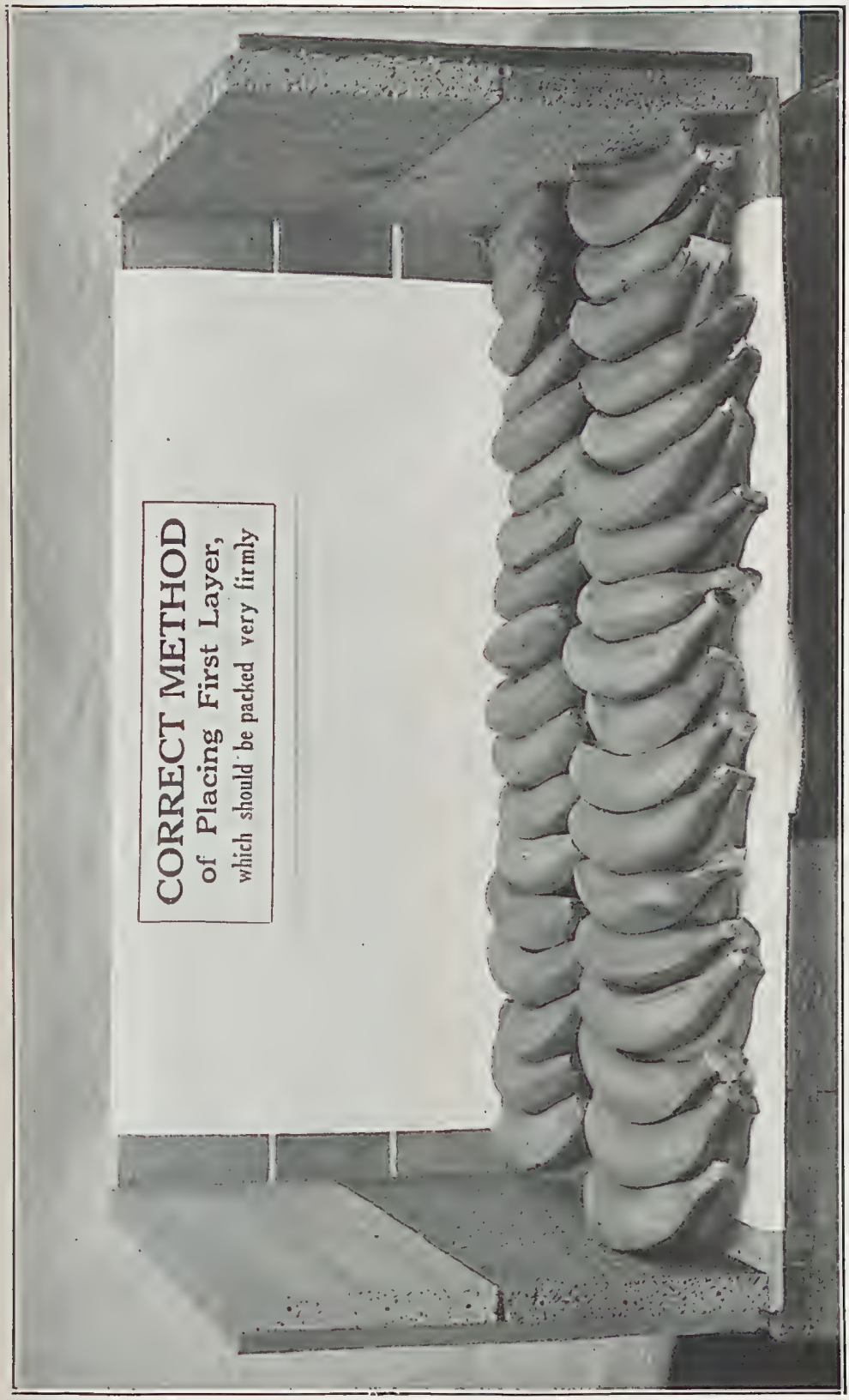
After cutting, bunches should be placed in the shade and out of the wind while awaiting removal to the packing shed.

It is suggested that the stool should be cut as near the ground as possible after removing the bunch to prevent the exuding sap affecting other bunches, and also to lessen harbourage for the beetle borer.

FROM PLANT TO PACKING SHED.

It has been noticed on many plantations that many growers are in the habit of carrying bunches on their shoulders, also stacking them on top of each other on a slide. This practice is considered one of the main causes of rupturing the fruit, thereby producing "blackend." For instance, a grower was observed sliding his fruit to his shed; he was using bags and straw between the bunches to prevent rubbing and marking, and although he was careful and no marks were seen at the flower end, he was doing considerable damage to the stalk end of the banana. When the damage was pointed out to him he was surprised. Others may be doing the same; they may grade well, pack correctly, and still all their good work may be undone by stacking bunches on top of each other on the slide, laying them on their side,

Plate 3.



"CHOICE."

carrying them on their shoulder, or otherwise handling them roughly. The following methods are recommended:—

1. Use wire ways (wire and pulley) where practicable to convey bunches to the shed. Care should be taken in preventing the bunches bumping and bruising. Considerable damage is often done to bunches when stopped at the shed end when a single wire is used. Sudden jerking of the fruit at this point often causes much damage.
2. Carry bunches to the slide track head, there cut the fruit off into "hands," and stack them on the slide; besides eliminating the risk of bruises and other injuries, more fruit may be loaded on the slide. This method has proved very effective.
3. On cutting a bunch leave it near the stool, then reduce it to "hands," and place them into baskets or boxes which may be carried to the packing shed with ease.
4. When unloading on to trimming or packing benches at the shed, grade the fruit as nearly as possible to required standards.

CUTTING FROM BUNCHES.

When cutting hands from the bunch do not (1) throw them on the bench, and (2) do not push the hands to the ground with your knife, after releasing them from the bunch.

A little care in this operation will show beneficial results.

CLEANING.

Growers are urged to clean the hands of any foreign matter caused by insects or decayed fruit, and when removing the petals from the flower end they are advised not to pinch or injure the fruit.

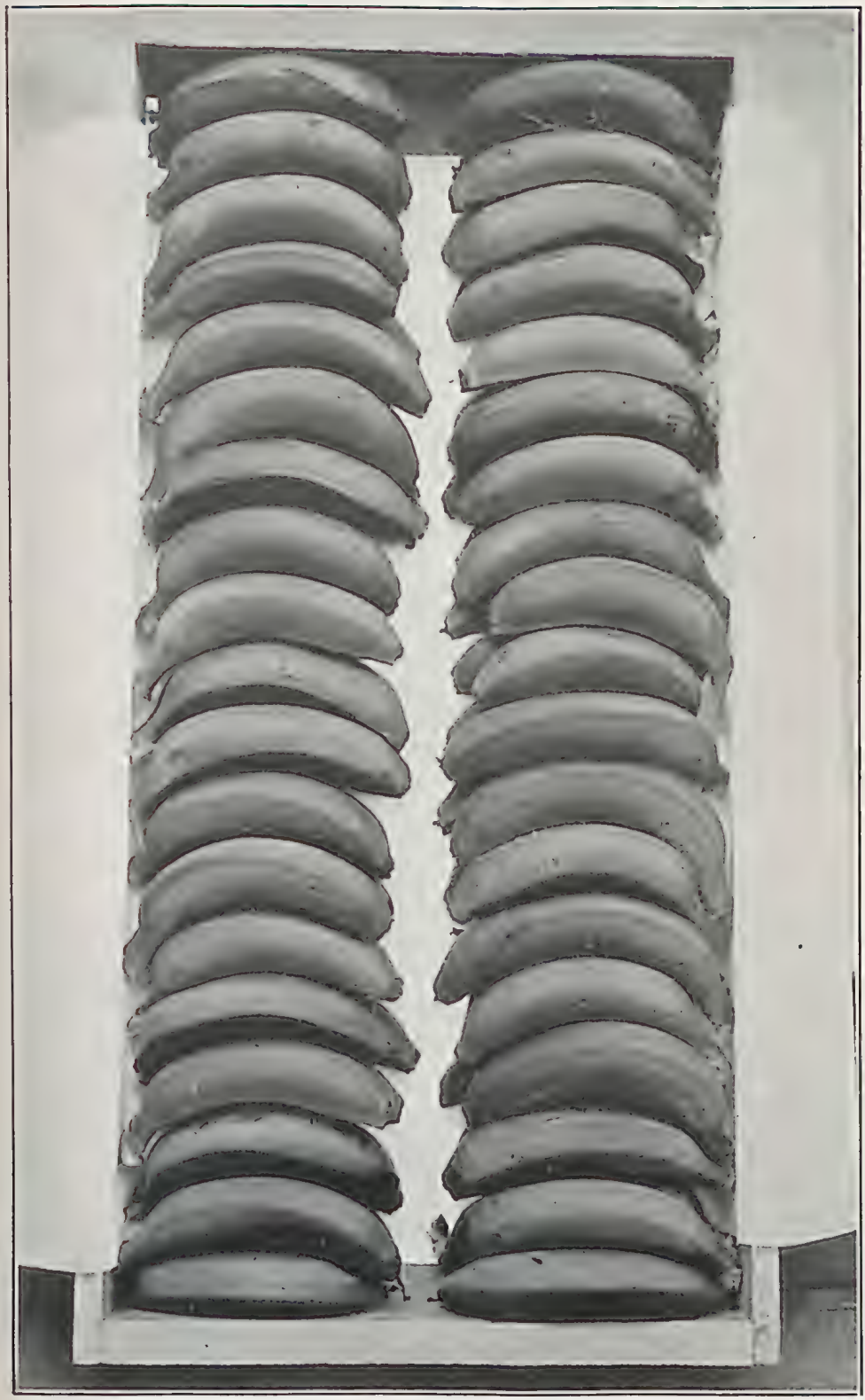
SWEATING.

It is considered by southern dealers that bruising and other injuries may be avoided by sweating the fruit for from 40 to 50 hours prior to packing. The wisdom of this practice is borne out by many successful growers in Queensland who cut from the bunch, say, on Saturday and start packing on the following Monday. These growers are strongly of the opinion that if bananas are sweated properly, firm packs are assured and less bulge is required in their cases. Therefore, it is recommended that **all bananas should be sweated at least 40 hours prior to packing, remembering that to sweat properly the bunches must be cut into hands. Sweating cannot be done on the bunch.**

BREAKING AND CUTTING OF FULL HANDS INTO SMALLER HANDS.

Observations on the Melbourne market in May and September of this year disclosed surprising and extensive injuries at the stalk end

Plate 4.



Showing even centre necessary to obtain a firm pack.

of the fruit. Retailers call the trouble "Blackend," which must not be confused with "Squirter," which is now engaging the attention of the University scientists in Brisbane and Melbourne.

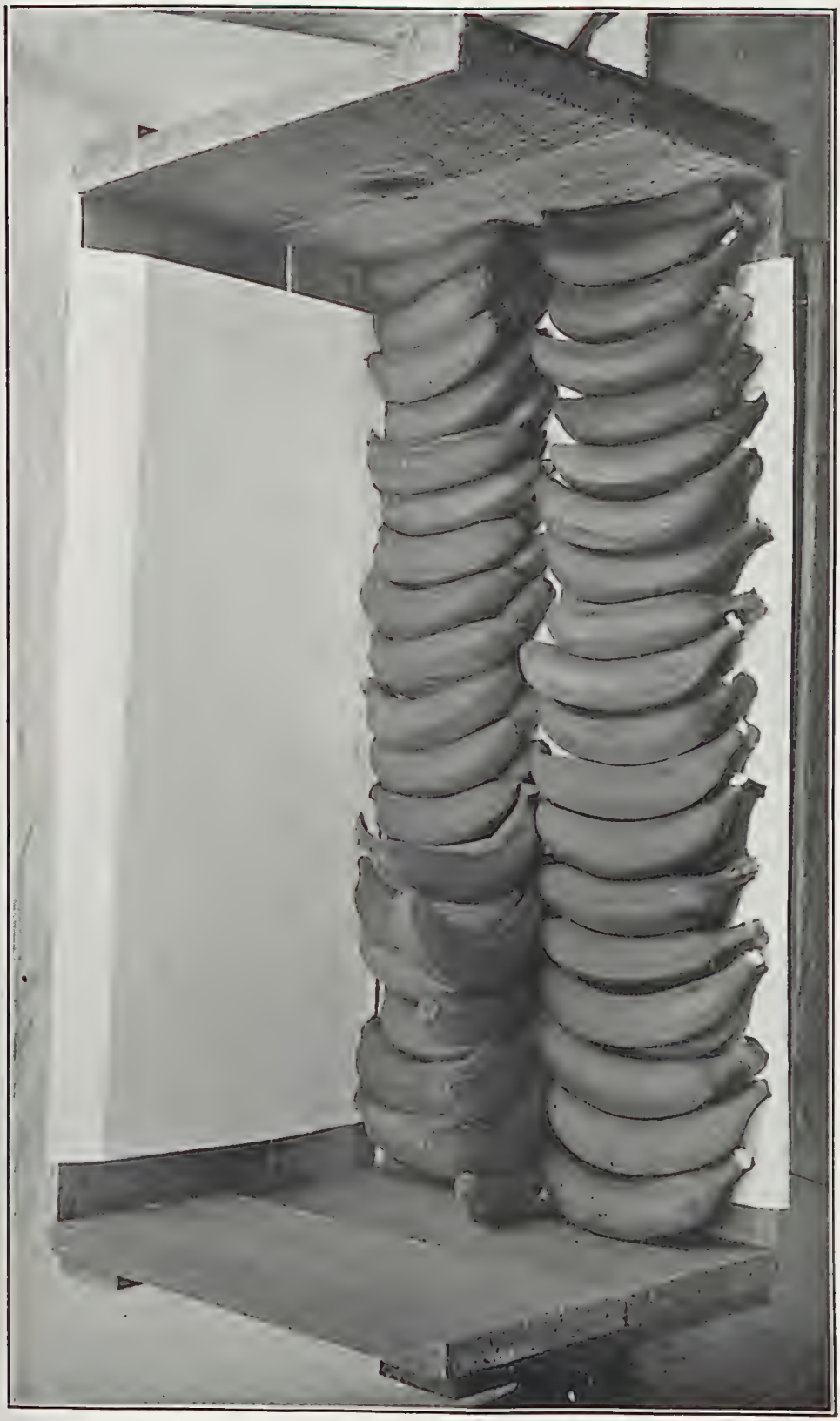
PLATE 5.

Correct method of breaking hands of Bananas.

PLATE 6.

Wrong method of breaking hands.

Plate 7.



Showing placing of centre Bananas.

When it is known that 80 per cent. of Queensland bananas after ripening show "Blackend," growers will realise how serious the trouble is. "Blackend" may be caused by breaking the hands. There are also many other ways of producing this defect. (See note on "Blackend.")

To eliminate "Blackend" altogether use a knife and cut the hands into the required number of fruit.

Where it is not practicable to cut every hand or fruit, the illustration (Plate 5) shows how to hold the hands when breaking to minimise the risk of "Blackend."

It will be noticed that the bananas are held firmly at the stalk end, not at the flower end of the fruit.

GRADING TO SIZE.

Perfect sizing is essential if perfect packing is to be done. Therefore, size bananas to the required grades into three separate compartments on the packing bench before starting to pack—viz., "Special," "Choice," and "Standard" as shown in Plate No. 17. The graders should throw out all undesirable specimens which are broken or otherwise injured. If packing from a mixed bench, specimens not up to the grade intended to pack are sure to be included. Conscientious growers who would not pack any inferior fruits if they knew it, have been observed to pack small bananas 4½ inches long in their first grade from a mixed bench. The packer should be free to give full attention to securing a pack of standard quality which is both firm and attractive.

Grade first and eliminate rubbish, then pack and watch results.

ELIMINATION OF INFERIOR FRUITS.

Do not include in your packs bananas that are broken or injured. Eliminate "cigar end," "immature fruit," or "twin bananas." (See Plate No. 8.) These included in your cases only bring your brand into disrepute among buyers. Send few, if any, second-grade bananas to the Southern markets. Shipments should be confined to "Special" and "Choice." This practice will improve your returns for the higher grades.

PACKING.

For some considerable time agents in the Southern Markets have been advising growers to pack their bananas in several different ways, for instance:—Some Adelaide agents suggest "full hands"; Melbourne,

"fours" and "sixes"; Sydney, "singles." But the retailers in Melbourne and Sydney say the number of fruit on each hand, whether "full hands," "fours," "sixes," or "singles," does not matter providing the fruit arrives in good order.

Plate 8.

Showing damaged fruit that should not be packed.

The ideal pack where the hands are nice and even, in my opinion, is in "full hands," but considerable difficulty is experienced in packing a firm case owing to the different shapes of the bananas, so that if the hands are spreading and straight bananas predominate, breaking the hands has to be resorted to.

However, it would be an advantage to growers if a standard pack were evolved—say, breaking the hands carefully into two, three, and four fruits, and packing as suggested in this pamphlet. There is always a number of single bananas which may be used for packing the centres of the cases.

A tight and efficient pack can only be brought about by packing the first layer in each case firmly; should this layer be slack it does not matter how firm the remaining layers are, the case will arrive slack.

The packing of a case of bananas is similar to the building of a house. If the foundation is faulty the structure will collapse. A little extra care with the bottom layer will go a long way towards obtaining an efficient pack.

Growers are advised to study illustrations 2, 3, and 4 and carefully note the end bananas in the first layers, as these key fruits prevent any movement of the fruit in the layer.

When the first layer is finished the second layer should be placed concave downwards (as shown in Plate 9).

Do not place the fruit directly on top of each other, but place them in the crevices or spaces. If bananas are placed directly on top of each other, the first handling the case receives will cause the pack to shift and become slack. It is possible to place 90 per cent. of the fruit in crevices. Do your packing in layers. (See Plate 9, not as shown in Plate 11.) A very firm pack can be obtained by packing in layers.

Much could be written on packing but growers are advised to study the illustrations carefully, as they are self-explanatory.

IMPORTANT.—Do not place small or inferior fruits in the centre of your cases.

BULGE REQUIREMENTS.

A question often asked by growers: Is the bulge required? The answer is **yes.** A slight bulge is necessary owing to shrinkage, but not so much as that seen on many consignments going South.

It has been noticed in Melbourne that the fruit is still slack even where a large bulge has been put on the case. It does not matter how much bulge is put on the case, if the fruit is not sweated it will arrive slack and marked.

Plate 9.

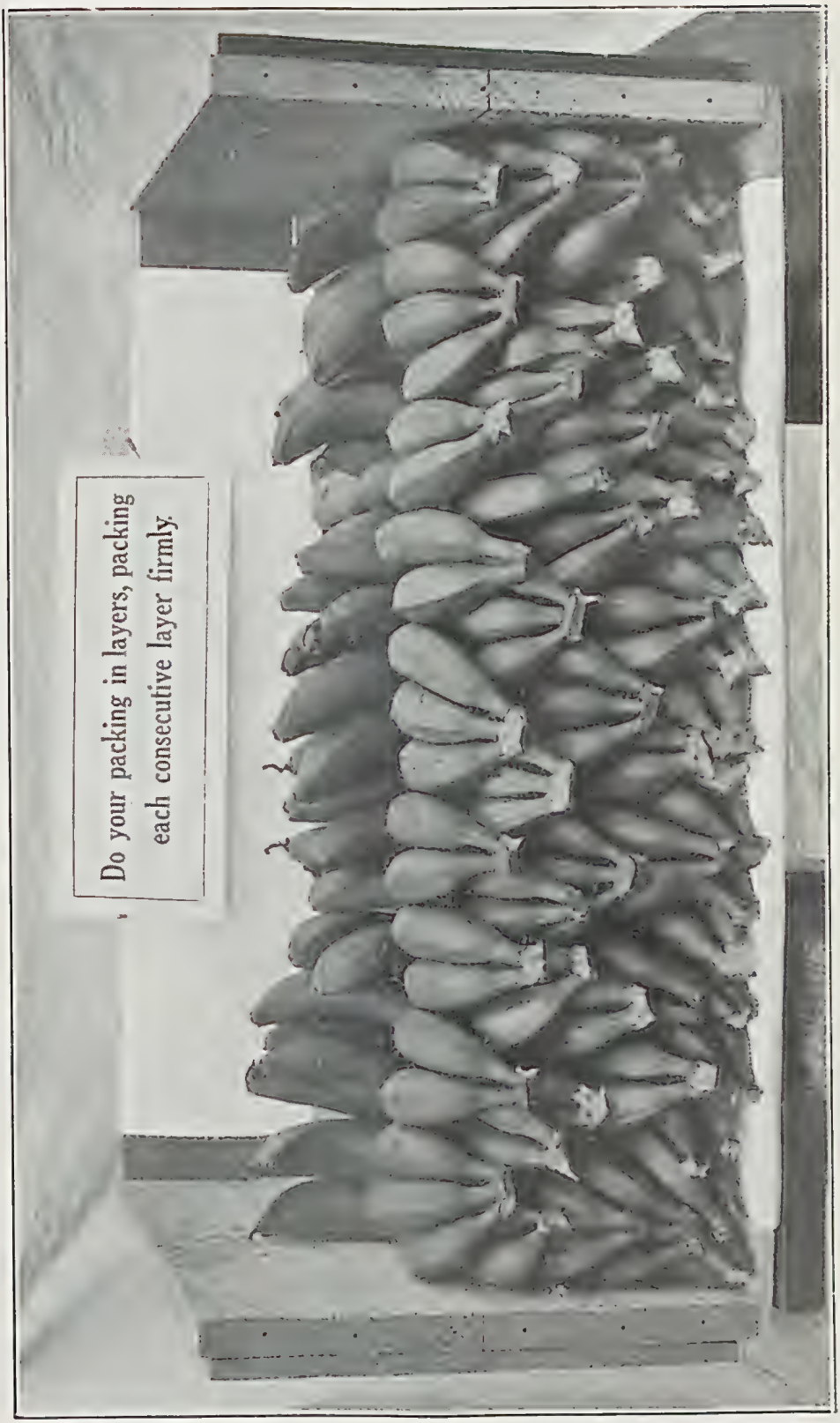
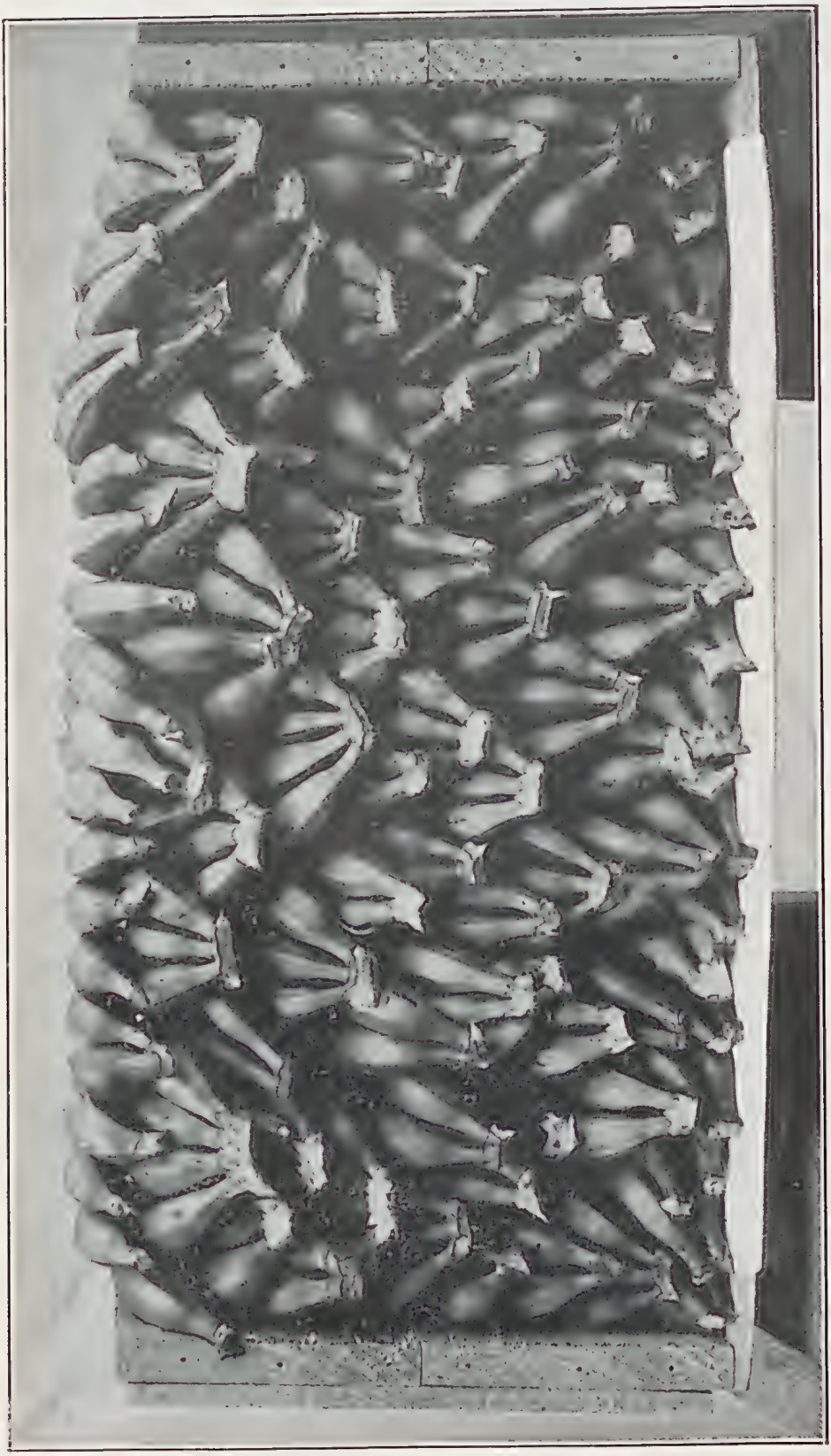

Do your packing in layers, packing each consecutive layer firmly.

PLATE 10.



Showing finished case opened at side. Note slight bulge at top and bottom.

Growers should therefore—

(1) Cut the bunches one day earlier.

(2) Sweat the hands at least 40 hours.

(3) Pack in layers firmly.

(4) Do not place the bananas directly on top of the other in the layers.

(5) Fill the centre of case properly.

Growers employing labour, whether for harvesting, handling, grading, packing, or carting, are urged to impress on their employees the necessity for following the advice given in this pamphlet.

A copy of this pamphlet should be always kept handy for reference.

BLACKEND.

"Blackend" is a defect much in evidence in the Southern States. Almost 80 per cent. of our bananas are affected. This injury is not at the flower end of the bananas, but at the stalk end connecting the hands. (See Plates 15 and 16.)

"Blackend" may be caused in many ways, but all causes may be eliminated by the growers and others concerned in handling the fruit on the plantations. The main causes are summarised:—

(1) Cutting the fruit from the plant, allowing it to fall to the ground.

(2) Carrying bunches on the shoulder.

(3) Stacking bunches on top of each side on slides or wagons.

(4) Rough breaking of the hands into smaller hands.

(5) Throwing full hands on to your packing table.

Growers are advised to watch their several handlings for rupture and other injuries, and to do their best to eliminate these causes of defective shipments.

FROM PLANTATION TO RAILWAY.

Absence of tarpaulins or any other protective weather covering on fruit wagons has been noticed in banana districts. Fruit going into trucks in a wet condition creates humidity in the truck, and it is hard to estimate the extent of damage caused by this avoidable condition. It may have something to do with "squirter," or may not; however, every conscientious grower knows that considerable damage must be caused by fruit going into trucks wet, and it is unnecessary to stress the obvious. Remedy—**Supply covers.**

PLATE 11.

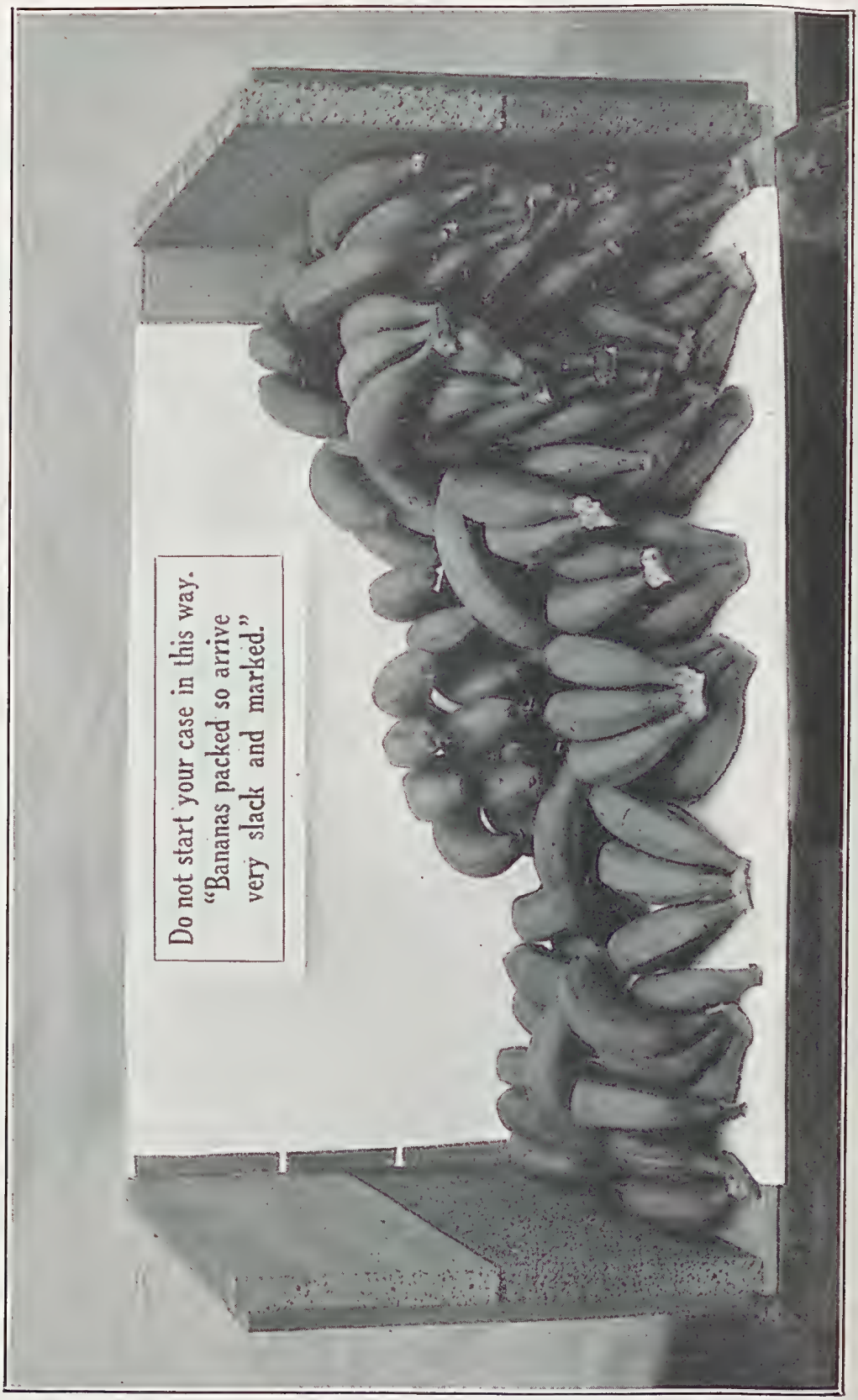
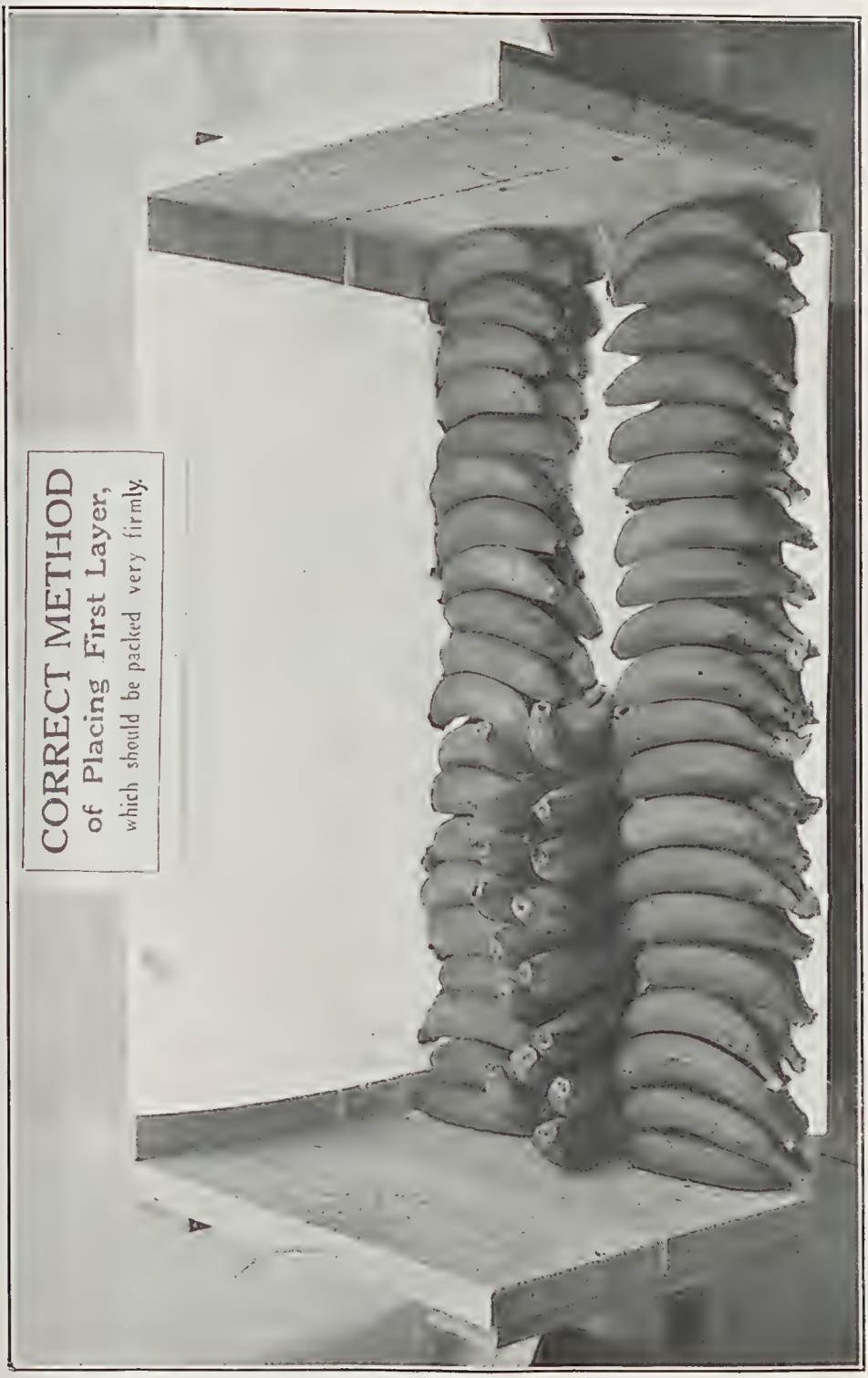

Do not start your case in this way.
"Bananas packed so arrive
very slack and marked."

Plate 12.


CORRECT METHOD
of Placing First Layer,
which should be packed very firmly.
STANDARD GRADE.

BRANDING AND NAILING.

Branding.

The attention of growers is drawn to unnecessary branding and also the crude methods used.

Many growers brand their cases well and leave no room for complaint, while others slum this operation by placing one brand over the other, making it almost impossible for carters and railway men to sort out and stack into separate dumps in Melbourne, Sydney, and Adelaide.

There is no need for the agent's name and address on each case. What growers should see to is putting their own names and addresses on plainly. (Under the Fruit Cases Act this is necessary.) Examples:—Plates Nos. 13 and 14.

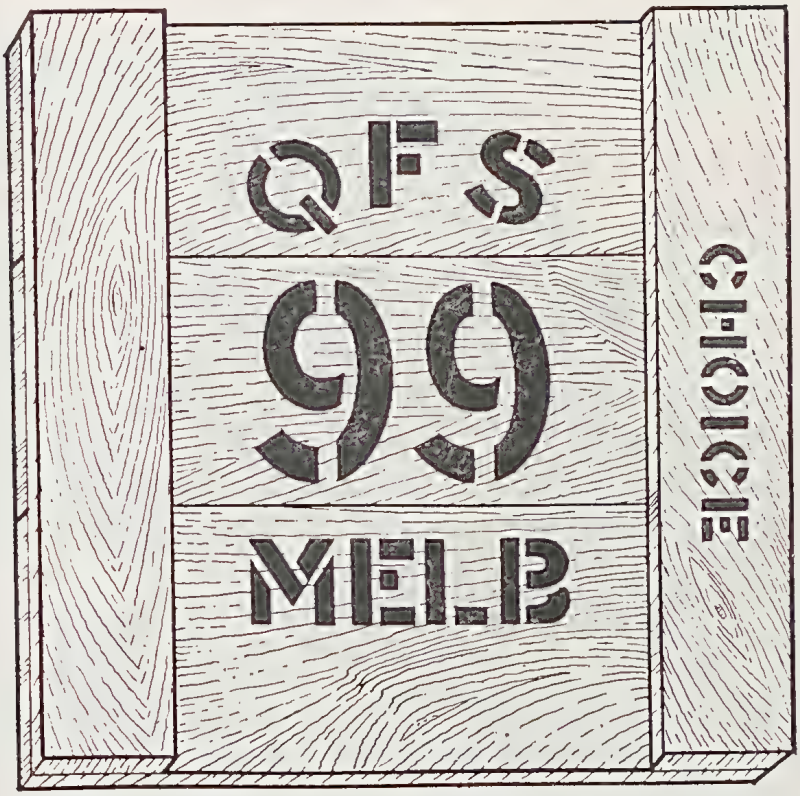
Plate 13.

Nailing.

Owing to so many breakages occurring during transport it is absolutely necessary to bring this matter before the growers. Many breaks occur through the cleats not holding, casemakers forgetting to clinch the nails on the inside. Some growers are using only 1½-inch nails, and after seeing so many broken and pillaged cases in Melbourne, the opinion of the Fruit Marketing and Packing Instructor is that no nails under 1¾-inch should be used. If difficulty is experienced in getting the nails to hold, rust them prior to using.

Over 200 cases weekly are renailed and fruit is never put back the same as it leaves the plantation, so the growers' attention to this simple, yet important, detail is obviously needed.

Plate 14.



Grade standards for Cavendish Bananas are as follows:—

"Special" shall mean sound fruit, free from blemish and properly packed, having a minimum length of eight inches and a minimum circumference of five inches.

"Choice" shall mean sound fruit, properly packed, having a minimum length of over seven inches to eight inches and a minimum circumference of four inches.

"Standard" shall mean sound fruit, properly packed, having a minimum length of five and a-half inches to seven inches and a minimum circumference of four inches.

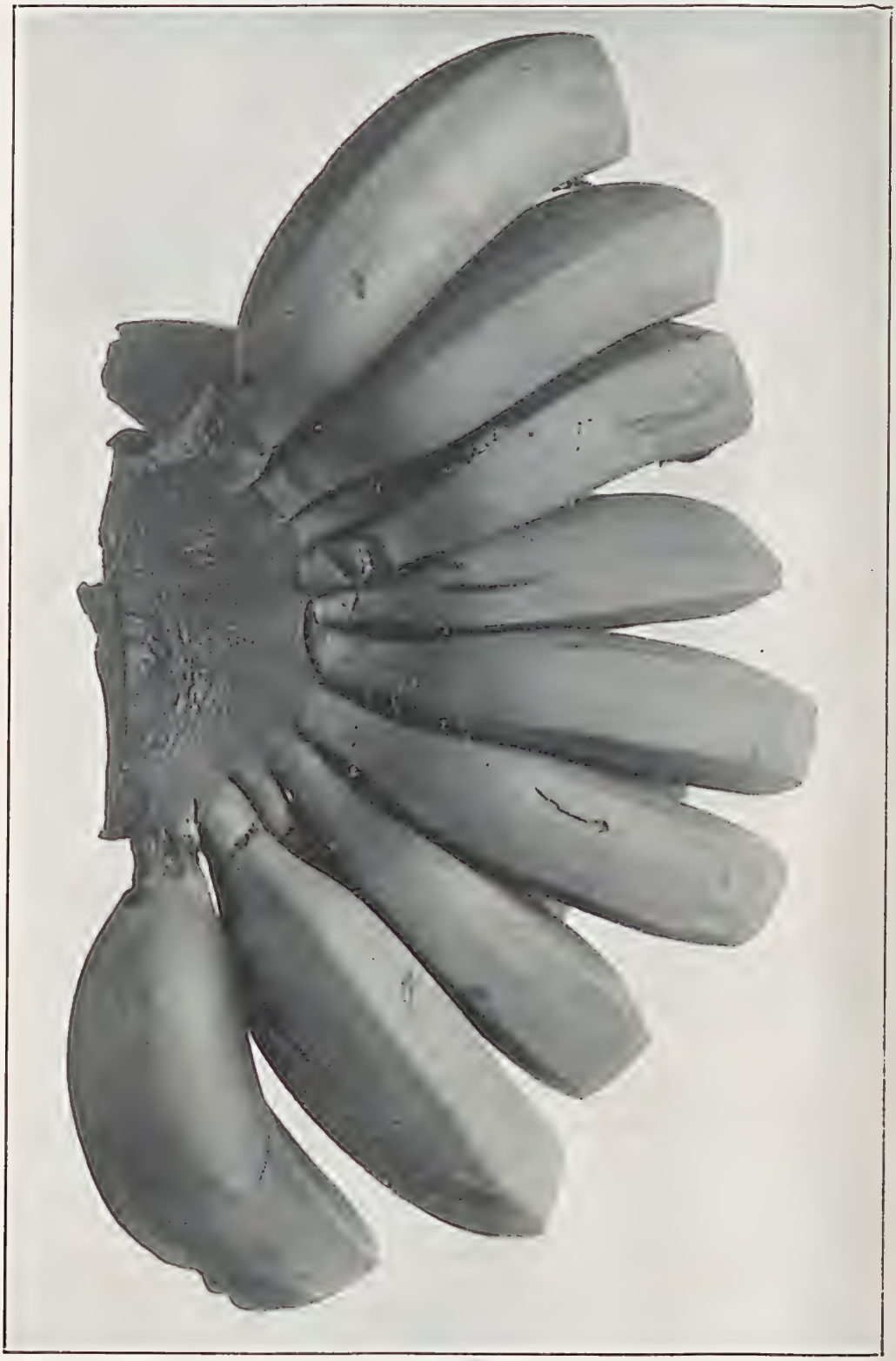
Note.—All measurements for length are to be taken on the outside of the curve from the junction of the fruit at the stem-end to the top of the fruit. Plate No. 17 shows the minimum size of the fruit for each of the above grades.

THE RETAILER'S POINT OF VIEW.

Particular attention is drawn to the fact that the cases are almost invariably opened on the side for inspection by buyers. The placing of good bananas, therefore, at the top and bottom of the case, without regard to the middle, results in the bananas being sold at the value of the inferior bananas in the middle.

The point to be driven home is that no grower can deceive the buyers. All the fruit has to be handled by the retailer, who examines each single banana before exposing them for sale. In Victoria the regulations prohibit the mixing of different sized fruits when offering for sale, consequently retailers are at considerable loss and inconvenience with badly graded fruit. Because of the fact that Queensland

PLATE 15.



Showing damage through careless handling, which results in "Blackend."

bananas are, in general, so unreliable in this respect, the retailer has little interest in their sale; and, instead of being a pushing salesman for this class of fruit, buys it only because he is compelled to stock it for those of his customers who demand it.

Plate 16.

Showing damage to stem connections through careless handling.

Only an honest pack can survive the actual test of retail sales, and the grower is forced into the position—whether he likes it or not—of having to give an honest, well-graded pack, if he wishes to maintain a satisfactory price for his product.

PLATE 17.

1. "SPECIAL." 2. "CHOICE." 3. "STANDARD."

Showing minimum size of Bananas allowed in the grades.

TURKEY REARING.

P. Rumball, Poultry Instructor.

There has been a serious falling off in the number of turkeys kept in Queensland during recent years, of which ample evidence is supplied by the Registrar-General in his annual reports. During the season

1921-22 there were 19,626 turkeys.
1922-23 „ „ 15,712 „
1923-24 „ „ 10,898 „

This decline in numbers cannot be attributed to the lowered value of turkey flesh, as excellent prices are generally realised for good birds in the local markets, and in seeking the cause, one is forced to the conclusion that faulty methods of breeding and disease are the principal factors, although seasons have probably played their part.

Suitable Localities.

The farm, by reason of offering turkeys ample range, thereby enabling them to indulge in some of their wild traits, is its natural home. Free range also enables turkeys to gather considerable quantities of their own food in the form of grass, insect life, and when stubbles are available, grains. Districts in which the soil is of a light nature and undulating is more suited to turkey raising than low-lying wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

Housing.

It is natural for turkeys to roost in the open, but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about ½ an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds, and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous tom can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that your stock are from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required, is stock in good hard condition and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and Toms 25 to 30 lb. in fair condition will be found to give satisfactory results.

Avoid in-breeding and endeavour to obtain occasionally new Toms from reliable stock, but before buying make sure that he comes from healthy parents, and take further precautions by isolating him for some two or three weeks. The best hens raised on the farm should be reserved for breeding purposes, and not sold because there is a good market.

Setting Hen.

Vermin must be carefully guarded against and when nesting in enclosed quarters, both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions you assure the young poults of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comportably mother about twenty-five. Food, water, and grit should always be handy to the setting hen, and if the tom is at all savage it is advisable to protect the nest and young.

Rearing.

It is found best to let turkey hens mother the chickens. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks, entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by only feeding the young chicks a little at a time and fairly frequently. This prevents them from over-loading their digestive organs and helps to retain that keenness of appetite which is essential to successful raising of poultry of all kinds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashes of bran and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

Diseases in Turkeys.

Turkeys are subject to practically the same diseases as other classes of poultry, but mention is made here of the most common and devastating diseases affecting the problem of turkey raising.

Black-head, Dipatitis, White Diarrhoea, &c.

This disease was given the popular name of black-head owing to the darkened appearance of the head of affected birds. The general adoption of the name is unfortunately misleading, as the darkening of the head is not noticed in all cases.

Old and young stock are affected, but heavy mortality is principally met with in young stock a few weeks old. The external symptoms are drowsiness, lack of vigour, and loss of appetite. Diarrhoea is nearly always present and of a yellowish colour, though sometimes white, due to the abnormal percentage of urates. The

disease usually appears in the intestinal tract, the ceaca being the most seriously affected. The liver quickly becomes affected. In view of the seriousness of this disease it is important in all cases of death from unknown causes, that the bird be opened and examined, and from a study of the accompanying plates the grower can without doubt ascertain if his losses are due to black-head.

Cause.—Bacteriologists do not agree as to the particular organism which causes this disease, but they do, however, assert that it can be transmitted from mother

Fig. 1.

Fig. 2.

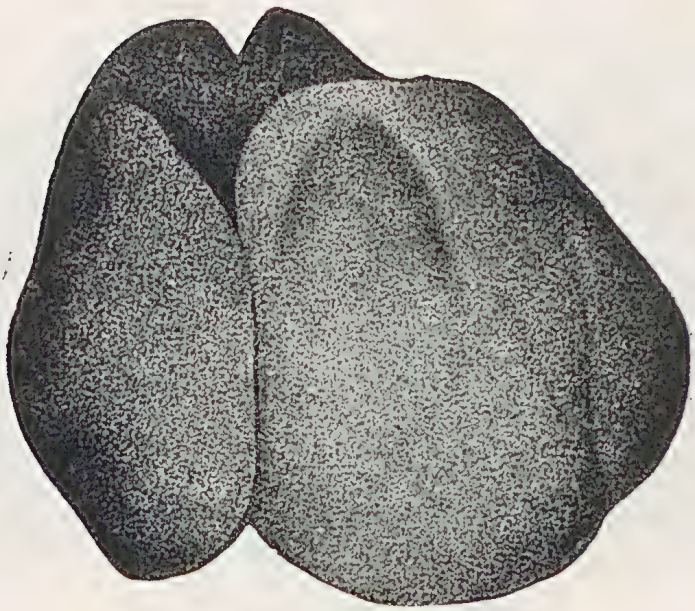


Fig. 3.—Liver of Healthy Turkey.

to progeny by means of the infection of the egg, hence the necessity of obtaining stock free from the trouble. It is also readily transmitted from one bird to another through food coming in contact with the droppings from diseased stock.

Medicinal treatment has not proved successful, but where stock has been recently infected the following remedies may be adopted as a means of arresting the disease:—Thorough cleanliness of quarters and disinfection with a 5 per cent. carbolic acid solution. A teaspoonful of hydrochloric acid to a quart of drinking water often gives good results. Sour milk, by its action in keeping the intestinal tract in an acid condition, is also of value.

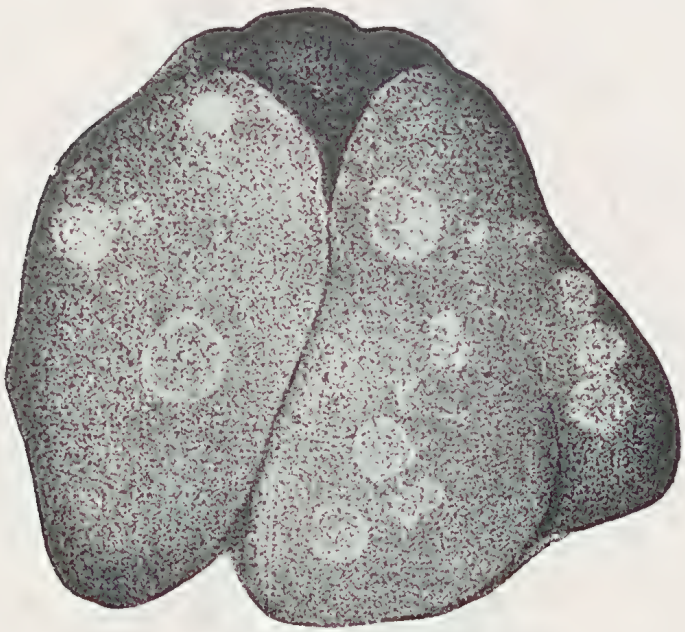


FIG. 4.—LIVER OF DISEASED TURKEY.

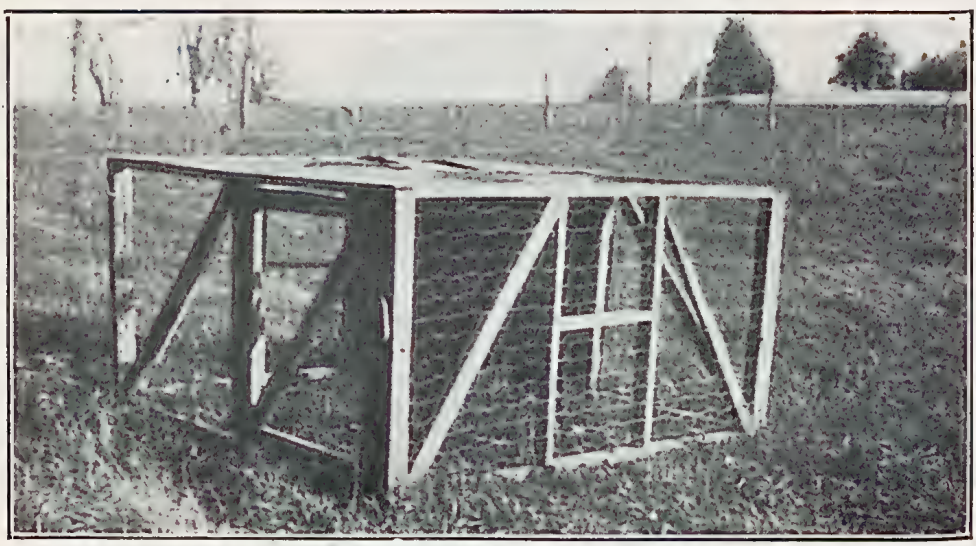


FIG. 5.—TURKEY BROOD COOP.

This coop meets every practical requirement of the turkey grower. It is sanitary, low in cost, easily moved, and affords complete protection with a minimum of confinement.

EGG-LAYING COMPETITIONS.

N.U.P.B.A., ZILLMERE.

FINAL SCORES.

The 1924-5 Egg-laying Competition conducted by the Queensland Branch, N.U.P.B.A., was concluded on 28th February. Prizes and certificates were gained as follows:—

Oakleigh P.F. (W. E. Woodward), Sunnybank, White Leghorns, 286 eggs, first prize (highest individual score, any variety).

W. Wakefield, Mount Gravatt, White Leghorn, 252 eggs, second prize, White Leghorn.

E. Walters, Moorooka, first prize, Black Orpington Section, 241 eggs.

J. Hutton, Kingsthorpe, second prize, Black Orpington, 239 eggs.

R. Duff, Waterworks road, highest aggregate score, any variety, 691 eggs.

Messines P.F. (H. E. Oldmeadow), first prize, Other Varieties, Rhode Island Red, 215 eggs.

Certificates.—

K. A. Sommerlad, Hornsby, N.S.W. (White Leghorn) .. .. 251 eggs.
A. Hodge, Kelvin Grove road (White Leghorn) .. .. .. 245 „
W. Wakefield, Mount Gravatt (White Leghorn) .. .. .. 244 „
F. P. Cumming, Clayfield (Black Orpington) .. .. .. 238 „
R. Duff, Waterworks road (White Leghorn) .. .. 237 „
G. Williams, Ipswich (White Leghorn) .. .. 235 „
R. Duff, Waterworks road (White Leghorn) .. .. .. 230 „
J. Pryde, Indooroopilly (Langshan) .. .. 175 „

The President's Gold Medal for most typical bird in the competition was awarded to Mr. T. H. Brotherton, East Brisbane.

The competition was only run for eleven months to allow of an earlier start this year, but as Mr. Woodward's bird has made such a good showing she will be retained the full twelve months so as to have an official record of her year's laying.

WHITE LEGHORNS.

Pen No.	Owner.	Month.	Eleven months' total.	Pen No.	Owner.	Month.	Eleven months' total.
104	Oakleigh P.F. ..	25	286	41	R. C. Cole	16	210
82	W. Wakefield ..	22	252	65	E. Tracey	22	210
97	K. A. Sommerlad ..	22	251	79	J. E. G. Purnell ..	5	209
21	A. Hodge	14	245	25	H. T. Britten ..	16	208
84	W. Wakefield ..	19	244	1	F. J. Williams ..	18	206
88	R. Duff	20	237	61	Carinya P.F. ..	18	205
95	G. Williams ..	20	235	48	R. C. J. Turner ..	16	202
89	R. Duff	17	230	174	S. L. Grenier ..	16	202
11	W. J. Berry ..	18	229	56	J. Hutton	17	201
20	A. Hodge	16	228	13	G. Marks	18	200
105	Oakleigh P.F. ..	14	226	80	J. E. G. Purnell ..	15	200
92	C. A. Hodgson ..	19	225	99	K. A. Sommerlad ..	19	200
12	W. J. Berry ..	12	224	64	E. Tracey ..	16	199
90	R. Duff	20	224	6	H. T. Pember ..	3	198
101	A. S. Walters ..	18	221	16	J. T. Webster ..	9	198
73	E. C. Raymond ..	18	214	51	J. Earl	8	198
19	A. Hodge	14	212	106	W. L. Howard ..	7	198
58	A. Staib	12	211	68	Kidd Bros.	19	197

WHITE LEGHORNS—*continued.*

Pen No.	Owner.	Month.	Eleven months' total.
74	E. C. Raymond ..	16	197
40	R. C. Cole	21	196
108	W. L. Howard ..	18	196
39	H. Fraser	16	195
78	M. F. Newberry ..	15	192
15	G. Marks	15	191
87	Enroh Pens ..	12	187
34	J. L. Chapman ..	21	184
10	W. J. Berry ..	18	183
69	Kidd Bros.	18	180
5	H. T. Pember ..	8	172
86	Enroh Pens ..	13	172
62	Carinya P.F. ..	17	171
26	H. T. Britten ..	19	170
47	R. C. J. Turner ..	0	164
98	K. A. Sommerlad ..	9	160
100	A. S. Walters ..	1	159
38	H. Fraser	0	155
60	A. Staib	13	155
63	Carinya P.F. ..	17	155
83	W. Wakefield ..	8	150
172	S. L. Grenier ..	8	150
59	A. Staib	19	146
76	M. F. Newberry ..	0	146
103	Oakleigh P.F. ..	0	131
45	P. F. Adams ..	0	128
46	R. C. J. Turner ..	0	124
91	C. A. Hodgson ..	0	121
93	C. A. Hodgson ..	0	116
50	J. Earl (replaced 6-10-24) ..	18	96
14	G. Marks	22	B224
30	M. H. Campbell ..	12	B215
28	M. H. Campbell ..	16	B210
52	G. E. Rogers ..	17	B208
71	J. R. Wilson ..	12	B207
42	R. C. Cole	16	B203
67	Kidd Bros. ..	10	B202
75	E. C. Raymond ..	12	B199
72	J. R. Wilson ..	19	B178
29	M. H. Campbell ..	8	B175
33	W. and G. W. Hindes	9	B173
49	J. Earl	16	B165
35	J. L. Chapman ..	0	B161
77	M. F. Newberry ..	17	B147
173	S. L. Grenier ..	10	B100
7	H. Sturman ..	13	B98
24	A. Neil	0	B86
70	J. R. Wilson ..	21	BE247
66	E. Tracey	21	BE239
102	A. S. Walters ..	19	E233
31	W. and G. W. Hindes	22	BE228
55	J. Hutton	18	BE227
18	J. T. Webster ..	19	BE221
54	G. E. Rogers ..	18	E221
37	H. Fraser	21	BE215
53	G. E. Rogers ..	21	E214
32	W. and G. W. Hindes	16	BE203
36	J. L. Chapman ..	14	E203
85	Enroh Pens ..	6	BE199
8	H. Sturman ..	12	E188
9	H. Sturman ..	21	BE188
27	H. T. Britten ..	3	E186
2	F. J. Williams ..	16	E184
3	F. J. Williams ..	12	E182
96	G. Williams ..	18	BE178
22	A. Neil	15	BE173
23	A. Neil	11	BE168
4	H. T. Pember ..	13	E157
57	J. Hutton	0	BE132

BLACK ORPINGTONS.

127	E. Walters	14	241
156	J. Hutton	19	239
144	F. P. Cummings ..	18	238
130	G. E. Rogers ..	8	228
126	T. H. Brotherton ..	11	226
143	F. P. Cummings ..	15	223
131	G. E. Rogers ..	11	219
113	W. R. Wilson ..	14	218
129	E. Walters	17	216
149	E. C. Raymond ..	21	218
150	E. C. Raymond ..	0	214
155	J. Hutton	12	211
110	T. Fanning ..	2	210
153	Enroh Pens ..	13	200
133	C. C. Dennis ..	10	198
125	T. H. Brotherton ..	13	194
116	G. L. Campbell ..	5	190
132	G. E. Rogers ..	18	189
145	Everlay P.Y. ..	17	189
111	T. Fanning ..	0	187
146	Everlay P.Y. ..	11	186
152	Enroh Pens ..	17	184
139	J. Prdye	0	182
134	C. C. Dennis ..	11	174
120	H. M. Chaille ..	0	172
128	E. Walters	15	172
112	W. R. Wilson ..	14	163
148	E. C. Raymond ..	0	162
137	W. S. Adams ..	7	160
124	T. H. Brotherton (replaced 30-8-24)	21	139
141	J. Pryde (replaced 7-7-24)	16	126
121	J. Potter	4	123
118	H. M. Chaille ..	2	87
119	H. M. Chaille ..	5	B202
142	F. P. Cummings ..	23	E265
154	J. Hutton	13	E239
147	Everlay P.Y. ..	4	E231
114	W. R. Wilson ..	6	E217
138	W. S. Adams ..	16	BE215
123	J. Potter	10	E201
136	W. S. Adams ..	13	E189
140	J. Pryde	2	E188
109	T. Fanning ..	2	E182
135	C. C. Dennis ..	20	E151
122	J. Potter	17	E148
115	G. L. Campbell ..	0	E143
117	G. L. Campbell ..	0	BE140
151	Enroh Pens ..	0	E126

B Signifies bird under standard weight.
E Signifies egg under standard weight.

OTHER VARIETIES.

Pen No.	Owner.	Month.	Eleven months' total.
159	Messines P. F. (R.I.R.) ..	16	215
169	J. Pryde (Lang.) ..	9	175
165	A. S. Walters (B.R.)	13	174
157	Messines P. F. (R.I.R.) ..	8	173
161	T. C. Ollier (B.R.)	15	173
168	W. H. Forsyth (S.W.)	14	172
167	W. H. Forsyth (S.W.)	7	166
160	T. C. Ollier (B.R.)	22	161
180	J. Ferguson and Sons (B.L.) ..	11	160
158	Messines P. F. (R.I.R.) ..	11	159
178	J. Ferguson and Sons (B.L.) ..	16	154
164	A. S. Walters (B.R.)	14	123
166	W. H. Forsyth (S.W.)	0	128
163	A. S. Walters (B.R.)	11	112
176	Everlay P.Y. (B.L.)	0	105
170	J. Pryde (Lang.) (replaced 23-6-24)	6	B144
175	Everlay P.Y. (B.L.)	17	E192
162	T. C. Ollier (B.R.)	8	E165
179	J. Ferguson and Sons (B.L.) ..	8	E132
171	J. Pryde (Lang.) (replaced 21-6-24)	8	E129
177	Everlay P.Y. (B.L.)	9	E127

C. KIDD, Hon. Secretary.

B Signifies bird under standard weight.

E Signifies egg under standard weight.

N.U.P.B.A. TOOWOOMBA SUB-BRANCH.

Single Test Egg-Laying Competition—Scores to 28th Feb., 1925.

BLACK ORPINGTONS.

Pen No.	Owner.	Feb.	Total.
41	Wilson, W. R. ..	24	249
24	*Carr, T. J.	20	247
51	*Holmes, R.	16	246
42	Wilson, W. R. ..	20	243
15	Macfarlane, K. ..	24	237
30	Adams, W. S. ..	24	233
25	Stephens, Moss ..	23	228
10	Everlay P.F. ..	22	225
23	Carr, T. J.	12	222
32	Radford, G. ..	20	222
40	Rogers, G. E. ..	21	220
45	Stephens, H. B. ..	9	219
28	Williams, W. D. ..	19	218
19	Maund, Mrs. L. ..	17	216
7	*Adams, P. F. ..	16	215
48	Head, J.	20	215
39	Rogers, G. E. ..	11	214
29	*Adams, W. S. ..	12	213
50	Ollier, T. C. ..	11	209
36	Rivett, R. R. ..	15	208
6	Walters, E. ..	17	203
9	Everlay P.F. ..	0	203
16	*Macfarlane, K. ..	13	201
22	*Walsh, H.	19	199
43	Smith, E. R. ..	20	198
20	Maund, Mrs. L. ..	0	192
49	*Ollier, T. C. ..	12	191
13	Burns, R.	10	185
47	*Head, J.	22	182
52	Holmes, R.	4	181
2	Hutton, Jas. ..	2	178
14	Burns, R. (dead) ..	12	178
3	McLay, J. A. ..	10	177
8	Adams, P. F. ..	21	176
27	Williams, W. D. ..	4	174
37	Short, J. W. ..	15	167
44	Smith, E. R. ..	13	167
38	Short, J. W. ..	17	165
1	Hutton, Jas. ..	10	164
5	Walters, E.	0	160
21	Walsh, H.	16	160
18	Champion, S. H. K.	15	149

* Signifies bird laying under-weight eggs.

BLACK ORPINGTONS—*continued.*

Pen No.	Owner.	Feb.	Total.	Pen No.	Owner.	Feb.	Total.
33	Potter, Jas. ..	0	148	31	*Radford, G. ..	2	101
4	McLay, J. A. ..	15	144	35	Rivett, R. R. ..	1	82
26	Stephens, Moss ..	16	140	17	*Champion, S. H. K.	0	41
34	*Potter, Jas. ..	0	132	12	Webb, A. W. (dead)	0	16
11	Webb, A. W. (dead)	0	122	46	Stephens, H. B. ..	0	1

OTHER VARIETIES.

70	*Dibbs, H. (Lang.) ..	28	284	69	Dibbs, H. (Lang.) ..	15	177
53	Warrian C. G. (Rock.) ..	22	265	54	Warrian, C. G. (Rock.)	4	146
66	*Becker, W. (Lang.)	26	228	71	Brand, V. (R.I.R.) ..	2	143
60	Le Pla, A. W. (R.I.R.)	18	221	72	Brand, V. (R.I.R.) ..	8	136
57	*Maund, Mrs. L. (Col. W'dotte) ..	14	204	63	Rafter, J. J. (B.L.)	17	134
64	Rafter, J. J. (B.L.)	23	195	67	Everlay P.F. (B.L.)	17	121
68	*Everlay P.F. (B.L.)	18	194	58	Maund, Mrs. L. (Col. W'dotte) ..	16	120
59	Le Pla, A. W. (R.I.R.)	9	188	55	Carr, T. J. (S.W.)	2	103
61	Harrington, J. (B.L.)	19	186	62	*Harrington, J. (B.L.) (dead)	0	42
65	*Becker, W. (Lang.)	0	184				
56	*Carr, T. J. (S.W.)	17	181				

WHITE LEGHORNS.

132	*Short, J. W. ..	19	277	99	*Newton, J. W. ..	18	203
112	*Chapman, S. ..	23	263	79	*McBean, S. ..	21	202
73	Dippel, D. H. ..	17	255	126	Maurer, G.	16	201
114	Cole, R. C.	19	251	101	Turner, R. C. J. ..	21	200
118	Goggins, J. ..	23	250	128	Stilton, E. J. ..	10	200
91	Stilton, G.	20	247	75	Wilson, W. ..	13	199
131	*Short, J. W. ..	16	247	78	Howard, R. B. ..	12	199
122	Grant, W.	17	244	97	Hunt, G.	12	199
110	*Enroh Pens ..	18	242	104	*Fallon, P. J. ..	18	199
121	Grant, W.	19	242	107	Adams, P. F. ..	18	198
123	King, J. E.	18	239	74	Dippel, D. H. ..	19	196
113	Cole, R. C.	20	231	95	Adams, W. S. (dead)	0	194
124	King, J. E.	19	229	106	*Hutton, Jas. ..	11	194
105	Hutton, Jas. ..	9	226	90	Ellis, L. E.	14	193
129	Manning, H. G. ..	17	226	103	*Fallon, P. J. ..	19	193
130	*Manning, H. G. ..	22	226	92	Stilton, G.	18	190
88	*Warrian, C. G. ..	23	223	102	Turner, R. C. J. ..	8	188
96	Adams, W. S. ..	19	221	83	Carinya P.F. ..	15	185
111	Chapman, S. ..	14	221	116	Taylor, Jas. ..	3	185
100	*Newton, J. W. ..	18	220	76	Wilson, W. ..	9	182
85	Rivett, R. R. ..	18	219	84	Carinya P.F. ..	19	181
115	Taylor, Jas. ..	7	214	81	Smith, E. R. ..	9	180
109	*Enroh Pens ..	19	213	77	Howard, R. B. ..	12	169
125	*Maurer, G. ..	12	212	89	Ellis, L. E.	11	167
87	Warrian, C. G. ..	21	209	98	Hunt, G.	16	165
117	Goggins, J. ..	19	209	119	Rogers, G. E. ..	8	162
80	McBean, S. ..	21	208	94	Williams, D. W. ..	9	161
93	Williams, W. D. ..	11	208	108	Adams, P. F. ..	3	152
120	Rogers, G. E. ..	22	207	127	Stilton, E. J. ..	2	151
86	Rivett, R. R. ..	14	204	82	Smith, E. R. ..	8	150

* Signifies bird laying under-weight eggs.

JOSEPH GARNER, Government Supervisor.

MOUNT GRAVATT COMPETITION.

In the course of January 4,582 eggs were laid, an average of 16·9 eggs per bird. Broodiness and moulting stock have been factors in reducing the output, but on the whole the figures are satisfactory. Two deaths occurred. Individual scores:—(U opposite the total figures indicates that the eggs are under the standard weight of 24 oz. to the dozen, and X opposite individual scores indicates that the figures are the total score of dead and replaced birds.)

SECTION 1.

White Leghorns (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Monthly Total.	Grand Total.
W. and G. W. Hindes ..	211	231	233	246	224	193	115	1338U
S. Grenier	209x	195	228	202	183	215	122	1232
T. H. Craig	204	216	210	227	160	207	123	1224
G. Marks	245	205	206	187	198	174	116	1215
W. Wakefield	134	214	218	197	220	225	131	1208
Mrs. L. Anderson ..	211	202	208	212	181	192	128	1206U
W. H. Flowers	178	157	208	220	226	217	121	1206U
H. Fraser..	219	182	198	217	203	174	119	1193
G. W. Cox	211	180	223	151	232	192	121	1189
H. T. Britten	231	223	166	192	197x	181	117	1190U
T. W. Honeywill ..	189	225	185	200	202	177	127	1178
R. C. J. Turner	206	209	180	209	159	213	116	1176
L. Bird	196	204	202	1 3	225	219	134	1169
Oakleigh Poultry Farm..	148	219	172	183	218	204	113	1144
J. E. G. Purnell	185	185	146	203	215	200	105	1134
Mrs. R. E. Hodge ..	183	200	160	212	183	182	106	1120
John J. McLachlan ..	179x	164	230	183	206	152x	105	1114
Kidd Brothers	197	195	165	203	158	191	86	1109
B. Driver	180	146	149	230	199	198	114	1102
A. A. Storling (Anconas)	152	144	215	195	164	185	94	1055U
H. P. Clarke	180	153	174	196	176	174	109	1053
A. Neil	212	189	187	188	92	184	103	1052U
L. J. Silman	189	200	154	177	169	155	100	1044
W. D. McHardie (Anconas)	191	168	143	177	181	176	108	1036
J. W. Newton	179	176	144	150	165	195	92	1009U
W. D. Melrose	117x	153	214	221	87	184	81	976U
T. W. Biddulph	223	204	106	174	109	135	85	951
Geo. Williams	123	40	204	202	187	187	98	934
Chris. A. Goss	8	227	112	116	206	191	75	860
Ancona Club, Pen 2 ..	169	149	110	111	171	133	94	843
Ancona Club, Pen 1 ..	113	155	156	180	87	16	60	708

SECTION 2.

Black Orpingtons (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Monthly Total.	Grand Total.
James Hutton	230	251	226	182	182	210	102	1281
James Potter	186	213	193	166	226	175	91	1159U
Mrs. A. E. Gallagher ..	182	212	171	198	204	171	127	1138
R. Burns	164x	188	192	192	176	192	110	1104
H. G. Stevens	203	184	175	159	186	156	124	1063
Carinya P. Farm ..	129	152	187x	166	182	206	72	1022U
Kidd Bros.	176	178	168	178	182	135	82	1017U
Mrs. A. Kent	191	232	100	153	135	173	113	984
E. Walters	138x	138	126	218x	221	136	52	977
T. W. Lenny	184	139	192	113	131	168	68	927U
H. M. Chaille	165	163	201	142x	210	37	99	918U
J. Ferguson	86	142	140	183	178	182	67	911
W. and G. W. Hindes ..	156	94	189	130	204	125	58	898U
E. C. Stead (W.) ..	103	178	132	181	145	139	99	878U

W. D. DELL.

APPLE TREE WOOLLY APHIS AND ITS SUBJUGATION BY *APHELINUS MALI* (Hald.)*

By HUBERT JARVIS, Entomologist, Stanthorpe.

Introductory Note.—Hitherto, in dealing with the occurrence of the highly pernicious Woolly Aphis of the apple, procedures recommended by the department have involved periodical spraying; and in the case of trees badly infested heading them back, and reconstituting them with a new apple variety, by grafting scions of the latter upon them, this necessitating the throwing of these trees out of bearing for a considerable period, even when the grafts "take."

Its occurrence in our orchard has also necessitated all apple-trees being grown on blight proof stock (*e.g.*, Northern Spy), a procedure not promotive of the success of apple-growing in many cases.

As distinct from this, the entomological method, as developed by Mr. H. Jarvis of this office, and with our concurrence, has been to confront the Apple Woolly Aphis with a formidable parasite, and so effect its extermination, and thus at once augment the fruit-bearing capacity of its host-plant (the apple) instead of suspending this, for the time being, and also obviate the costly and arduous work of spraying.

The valuable undertaking that the Stanthorpe Entomologist has already accomplished in this direction is set forth in the appended memorandum and merits our highest commendation.

It should have the effect, moreover, not only of banishing a very serious enemy of the fruit tree named, but also of rendering it practicable henceforth to grow the apple at Stanthorpe on stocks everywhere suitable to the soils and conditions that obtain there—a procedure that hitherto, owing to the continued presence of this pest, was not only impracticable, but it involved the use of a stock, the Woolly Aphis resistant Northern Spy, itself most prone to so serious a disease as is Apple Root Gall, from whose attacks other apple stocks are comparatively immune.—HENRY TRYON, Entomologist in Chief, 11th March, 1925.

THE REPORT.

I have the honour to submit the following report on the Woolly Aphis Parasite (*Aphelinus mali*, Hald.) and its work in this district, during this season.

In April, 1923, application was made to Dr. R. J. Tillyard, M.A., D.Sc., &c., Entomologist in Chief of the Cawthron Institute, Nelson, New Zealand, for a consignment of the Woolly Aphis Parasite (*Aphelinus mali*), reported at that time to be doing such good work in controlling the Woolly Aphis in New Zealand.

Dr. Tillyard was good enough to promise a supply of the insects for this district, and arrangements having been made for their reception, aphides harbouring them accordingly arrived on 14th August, 1923. The material sent by Dr. Tillyard was at once taken to the Departmental Insectary, opened there, and placed in a special breeding cage designed by Dr. Tillyard for the purpose of rearing the parasites and meanwhile procured. Several of the individual aphids received were now examined, and living Aphelinus pupæ were found, within the dead aphis "shells," so every hope was entertained of a number of parasites hatching out.

On the 29th of August, 1923, eight parasites emerged from the material in the breeding cage, and daily henceforth further hatchings were recorded until 5th October, 1923. About 133 parasites were thus hatched from the consignment sent. These were liberated in three orchards, one situated at the Summit, one at Stanthorpe, and one at Applethorpe. At the time of liberation cold and very strong winds, from the west and north-west, were daily experienced.

In two of the orchards the Aphelinus failed to establish itself. In the remaining orchard, however, situated at Stanthorpe, it became established, although not in any great numbers. On 18th March, 1924, the nursery tree, in the Stanthorpe area, was visited by Mr. A. A. Girault (Assistant Entomologist, Brisbane) and myself, and three living individuals of *Aphelinus mali* were collected, one on the nursery tree, and two others on apple-trees, about fifteen yards distant from the nursery tree. Twigs, bearing dead Woolly Aphis, were cut from this tree and placed in the Insectary cage, and on 9th September, 1924, several specimens of Aphelinus hatched from this material; thus proving that it had established itself, and had survived the winter.

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* This is a small hymenopteron, (Fam. Chalcididæ, s-fam. Encyrtidæ, Tribe Aphelininæ) measuring 1·2 mm. in length and 2·3 mm. across the wings. It is dark-brown, having the legs with the thighs (femora) varied with white or yellowish white, and the forelegs (tibiæ), and feet (tarsi) whitish coloured also.

The nursery tree was then, at this date, examined, and numbers of Aphelinus were found to be hatching daily thereon also. But now there were no leaves on the tree, and only a little Woolly Aphis, and no time was therefore lost in artificially infesting the nursery tree with the parasites' host-insect. This was done by collecting large quantities of aphis-infested twigs from other sources, and then placing them among the branches of the nursery tree, at the same time making incisions in the bark, to facilitate the establishment of the aphis.

The parasites were then let alone until early in November, when the work of distribution was commenced. By this time, there were hundreds on the nursery-tree, which had to be continually supplied with fresh Woolly Aphis, in order to maintain the numbers of Aphelinus on it. In spite, however, of this continual reinfestation of the nursery-tree the little parasites eventually caught up with the developing aphides and completely destroyed them.

From this time to the present date (March, 1925), its propagation being continuously effected, the increase of the Woolly Aphis Parasite has been rapid; and it is now, thanks to our united efforts in disseminating it, well established throughout the district.

The good work it is doing is remarkable, as is evidenced by the testimony of numerous growers, and also by that of the inspectorial staff of the Department of Agriculture. All orchardists who have now the parasite established in their orchards, are most enthusiastic in its praise, and it is only reasonable for us to hope that at last we really have a control measure for this unsightly and destructive pest (the temporary and local subjugation of which has hitherto involved the expenditure of much time and money). This hope regarding its control is supported by the recent account, by Dr. Tillyard himself, of the work of this Woolly Aphis Parasite in New Zealand. He, in fact, writes as follows:—

> "Only three years from the date of its original introduction the parasite has succeeded in practically eliminating the Woolly Aphis from large areas of orchard country in the Dominion. The unexpected and almost phenomenal success recorded from all parts of the country has been, I think, almost entirely due to the steady and persistent manner in which large numbers of carefully bred and packed specimens, in healthy condition, have been sent out from the Cawthron Insectarium."—"New Zealand Fruit Grower and Apiarist," 16th September, 1924.

I am very pleased to be able to state that we also have, too, experienced this almost phenomenal success, and that the work already accomplished in this district by the parasite is truly remarkable.

I am greatly indebted to every member of our inspectorial staff and to the Chief Inspector, Mr. T. W. Lowry. In spite of their heavy ordinary duties, all the inspectors have been unremitting in helping to distribute the parasite to as many orchards as possible, within their respective areas.

Mr. F. Becker has had entire charge of the work of distribution at Ballandean and Eukey, and has done excellent work in establishing Aphelinus throughout these areas.

It is thus hoped, by next season to see *Aphelinus mali* established in every single orchard in the Granite Belt. A special effort will also be made to introduce Aphelinus, the useful insect, to other dark-coloured aphids, and thus especially to associate it with the notorious Black Aphis of the peach.

One remarkable feature of the activity of this little parasite is its ability to cover long distances by flight. Inspectors St. J. Pratt, T. Jardine, and F. Becker all report having found Aphelinus established at spots long distances remote from the original centres of liberation. In some instances—as shown by inspection—the distance of 3 miles has been covered by the parasite.

This fact should materially help in its distribution.

Aphelinus—Control of other Aphides.

I consider that an effort should be made to extend the usefulness of this valuable parasite to other parts of Queensland, especially as a possible agent in the control also of the Orange Aphis and of the aphis injuriously associated with the banana.

Instances of *Aphelinus mali* attacking aphides, other than the Woolly Aphis of the apple in New Zealand are already on record.

In this connection Dr. Tillyard reports as follows:—

> "Several cases of *Aphelinus mali having successfully parasitised the Black Aphis of lemon-trees are reported,* and it would seem to be well established by now, that the *parasite will attack any dark-coloured aphis.* In view of the fact, the Commissioners for the Murrumbidgee Irrigation areas in

New South Wales have recently written and applied for a consignment to enable them to cope with the Black Aphis, which is doing so much damage to the orange and lemon orchards there.''—Dr. Tillyard, ''New Zealand Fruit Grower and Apiarist,'' 16th September, 1924.

I have, then, every confidence in assuming, as above suggested, that *Aphelinus mali* (if it were found practicable to establish it) would prove of the greatest assistance to citrus and banana growers in Queensland in helping them to control the two aphides of their respective crops.

Details of Distribution.

The following is a list (not yet complete) of orchardists in the Stanthorpe district, who have received the Woolly Aphis Parasite this season, 1924-25. I give it, hoping that it may be of assistance to those who may be situated in the near neighbourhood of orchards where the parasite has been liberated and from which, as a source, a supply of the living insect could be obtained.

APPENDIX.

Applethorpe.—

Messrs. D. Pfrunder, P. L. Pfrunder, S. Green, A. Greenhow, J. W. Barlow, J. Bishop, Paton Brothers, H. Ludlow.

The Summit.—

Messrs. A. H. Paget, W. Burnett, W. Maggs, A. Simpson, L. H. Flood, A. Chapman, D. Taggart, R. Letters, G. Whitehead, F. M. Jones, G. Ross, —. Carruthers, —. Lineker, J. Woodmansey, F. Mathews, E. Jolly, W. King.

Thulimba.—

Messrs. J. F. Clegg, E. Donnely, J. Lumb, A. W. Baldwin, G. Ferguson, J. Tray, G. Phillips, A. Grant, Mrs. Yuille.

Cottonvale.—

Messrs. W. Nugent, B. Vise, F. Hopgood, E. Cotton, H. Woodford, R. W. Strain, E. R. Martin, G. Newlands.

Dalveen.—

Messrs. F. Stephens, C. Knight, F. Coomber, J. Campbell.

Severnlea.—

Messrs. J. Cran, A. Fleming, J. Marshall, J. Townsend.

Fleurbaix.—

Messrs. J. Anthony, F. H. Fernside, J. Young, E. C. G. McNaught, H. Hutchison, D. Waters.

Broadwater.—

Messrs. A. Searle, —. Penfold, W. Kilgour, R. Ward, J. Brownjohn, A. Brownjohn, A. J. Low, J. Schneider, J. McGregor, H. M. Jones, A. L. Teitzel, R. Clarke, —. Hamlyn Harris, W. Salisbury, J. Yates, J. Sweet, R. Dawes, R. Notley, P. Pine, G. Gow, C. Dunbar, J. Mehan, R. Nelson, J. Wright, J. Brown, A. March, J. Ross, E. Ward, J. Brock, L. Rowbotham, A. Greaney, W. Heydon.

Fletcher.—

Messrs. J. Gibb, H. Wright, H. Clarke, J. Jackson, H. Swan.

Glen Aplin.—

Messrs. A. Gemmell, J. O'Dwyer, T. W. Letchfield, W. H. C. Laird.

Ballandean.—

Messrs. A. E. Cowley, D. Marshall, E. Hobson, R. Ruegg, H. Mungall, R. Smith, T. Fletcher, A. Johnson, J. Johnson, F. Pethford, F. Clarke, W. Dean, J. J. Batten, W. Laynam, W. Bohn.

Amiens.—

Messrs. W. Cowie, L. W. J. McBeth, H. B. Mann, P. Marr, State Farm, W. Bourke, W. D. Fletcroft, C. Munn, S. Harding, E. Jamison, J. Brown.

Bapaume.—

Messrs. R. G. Grey, G. Batstone.

Eukey.—

Messrs. J. Ross, J. Rodgers, W. Ranger, A. A. Palmer, J. Palmer.

The majority of these orchardists received from thirty to forty parasites; in many cases over fifty were liberated in individual holdings.

FODDER CONSERVATION.

N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

The value of a store of conserved fodder to meet a period of shortage is so universally admitted that the comparative neglect of the practice gives cause for wonder.

The lesson of the seasons, since settlement first took place in Queensland, is that periods of more or less acute shortage of pasturage recur at frequent intervals. A review of the past forty years will recall long dry periods with fodder shortage and great stock losses. The years 1888, 1902, 1915, 1919, 1923 were particularly disastrous, when even the regular rain blessed districts in the North, Centre, and South experienced one or more seasons of extreme shortage.

The losses of stock are not only disastrous to the owner but to the State as well, for the prosperity of one is reflected in the other. The pastoralist, with thousands of stock depastured on many square miles of country, may be of opinion that conservation of fodder is not practicable on large areas, and that the prices of fat cattle will not allow of the expense of hand feeding stock in a dry time. While admitting there is some reason in this opinion, it cannot be regarded for a moment as conclusive. Pastoral areas, as a rule, are not as heavily stocked, on account of recurring droughts, as they would be if a good season prevailed each year, or if stock had to travel shorter distances to water. It is among the weaker stock and breeders that the greatest dry times losses occur. While the loss of a bullock of marketable age may be set down somewhat definitely, the loss of the progeny of the breeder, which would reach marketable age in three, four, or five years, as the case may be, cannot be so clearly arrived at, and while at the time of a severe drought prices may be low, it is probable that through depletion of numbers, and other causes affecting the market, the prices a few years after may be much higher.

Conservation of Natural Grasses.

On every large holding there must be some area close to permanent water where the wealth of natural grasses can be conserved as hay during favourable seasons or fodder crops grown. By running the weaker and breeding stock on country near stores of conserved fodder and permanent water in dry times, losses would be greatly minimised. Stock owners are appreciative of the fact that where water is in infrequent supply over a run, water frontages are quickly eaten out and that with weak stock, the journey from feed to water in times of scarcity is a contributing factor to lowering vitality.

It is questionable if the feeding of the store of fodder to the segregated animals would entail any greater expense than the continuous patrol of the water supplies to keep them free from the pollution that would be caused by these weaker animals becoming bogged and dying.

While it may not be practicable to conserve enough fodder in one year to feed a large number of stock during a prolonged dry spell, it should be possible to do so if storage were made a yearly practice, since in our experience a cycle of good seasons generally follows seasons less favourable.

Possible Deterioration of Stored Fodder.

The possible deterioration of conserved fodder either as hay or ensilage need not be taken into account. The intervals between periods of scarcity are usually short enough to show that any possible diminution of the food value in stocks of fodder properly conserved would be negligible. The actual length of time over which a well protected stack of properly made hay, or a properly constructed silo filled with well made ensilage, may be kept without serious deterioration has not been determined, but it is quite safe to say that any stock of well cured hay or well preserved ensilage will come into use long before it will suffer any serious diminution in fodder value.

An Insurance Policy.

In time conservation of fodder may be regarded by the stock owner as a premium on an insurance policy against stock loss, which will mature within a more or less short period of time. This applies more particularly to the stock owner on the larger scale whose object is an income from the marketing of stock as stores, breeders, or fats, rather than from such products as butter, cheese, and wool. To the man on the smaller area the value of conserved fodder, more especially from cultivated crops as hay or ensilage, should make a greater appeal.

Land values, as a rule, are very much greater on the smaller holding, while costs of production have greatly increased with the general cost of living, rendering it more strongly imperative that a greater return from the land must be secured.

Hay

While silage is conserved fodder in its green and succulent stage, hay may be defined as conserved fodder in a dry form. As with properly made silage, little nutritive value is lost in properly made hay. Silage is fodder stored with its full amount of moisture, while hay is fodder with sufficient moisture dried out to prevent any adverse fermentation when stacked. While satisfactory silage can be made of most green crops, the same cannot be said of hay; crops such as maize and sorghum, though frequently stored in the dry stage, are not referred to in this connection. All plants that stock will eat in their natural condition, that will admit of reasonably quick drying, and that will permit of easy handling, can be made into hay.

Fodder Crops.

The principal crops that may be grown for hay are wheat, oats, rice, barley, Sudan grass, millets of Panicum and Setaria species, sundry exotic grasses and legumes such as lucerne, cowpeas, velvet beans, mung beans, field peas, and vetches. In most parts of the State natural grasses grow luxuriantly, and in almost any good seasonal year they will provide heavy crops that, when cut at the right time and properly cured, yield a most palatable and nutritious fodder. Of the last named the grasses of the Western Downs stand out as the most valuable in the world—Blue grass (*Andropogon Sericeus*), Mitchell grasses (*Astrebla* sp.), and Flinders (*Iseilma Mitchelii*) being especially valuable. Among others common to country nearer the coast are Kangaroo (*Authistiria* sp.), Wallaby (*Danthonia* sp.), Bunch spear (*Heteropogon* sp.), Native sorghums (*Sorghum fulvum* and *plumosum*), Brown top (*Pollini a Fulva*), other Blue grasses (*Andropogon* sp.), Spring grasses (*Eriochloa* sp.), various summer grasses (*Panicum* sp.), Chloris, and others of similar species and habit.

The nutritive value of any sample of hay depends on the nature and quality of the material from which it is made, the changes and losses, if any, incidental to the process of curing, and the changes which occur after it is stacked. Haymaking admits of several variations according to the variety of fodder and seasonal conditions when harvested. There are several conditions which must always be observed to insure a good product. To make the best sample the crop must be cut at the right time and the curing done so as to procure a bright green colour, good aroma, retention of the leaves and other fine parts, especially in legumes, with an absence of dust and mould. The proper time to cut is when the plants possess the greatest amount of digestible nutrients combined with palatability.

Cereals.

In cereal crops the proper time to cut is shortly after flowering, when the grain is in the soft or doughy stage; in lucerne, as soon as possible after the first flowers have appeared. In grasses of perennial habit, more especially those grasses which stand to grow tall and rank, the proper time is just prior to breaking into flower. This is most important since from the time of flowering the amount of woody fibre rapidly increases, digestibility decreases, and palatability in many cases disappears. With grasses of annual habit such as Flinders grass, summer grasses, Panicum, Chloris, and Eleusine sp., which are often more palatable to stock after flowering, cutting could be deferred until the seed is formed. It may be noted that in many annuals palatability is greater after seeding than before, a probable provision of nature to secure a perpetuation of the species. Legumes, other than lucerne, should be cut to secure the best advantage when the pods are well set but not ripe.

Hay Curing.

As previously mentioned the curing of hay lies in the abstraction, by drying out excess moisture which would cause deterioration by undue fermentation and the production of fungi or moulds. The amount of moisture in properly cured hay varies from 10 to 20 per cent., largely in proportion to the crop of which it is made. An indication of a good keeping quality is shown when in stacking it packs well when trodden down. As a general rule the hay should not feel damp to the hand, neither should it be so brittle as to break easily when twisted or bent. The time occupied in drying depends on the degree of succulence in the crops, and weather conditions. The dryness and temperatures of the soil, the humidity of the atmosphere, and intensity and continuity of sunlight and heat are all modifying factors which combine to prevent any set rule being established.

A consideration of the processes the plant undergoes in being cured will be helpful. Various changes rapidly set in as soon as the crop is cut, the most obvious as well as most important being the evaporation of moisture. After the plant is cut the leaves and stem remain alive for some time, and the leaves continue to draw moisture from the stem if not killed too soon. As the stems are the most difficult to cure it is obvious that the leaves should be allowed to assist in drawing off all possible moisture. Hence the necessity of protection from direct action of a hot sun or drying wind by raking into windrows and cocking loosely as early as is directed by weather conditions. Judgment is needed in cocking before the leaves are entirely dried out and their property of drawing moisture from the stems destroyed. Hay cocked in the hot sunshine entraps much warm air which greatly assists the transpiration of moisture. The size of the cocks will to an extent be governed by the succulence of the material, and they should be narrow and high rather than broad and low. Generally it is not necessary, unless rain falls, to interfere with the cocks before carting to the shed or stack, but if uncertainty is felt of the completeness of cure of the lower portion of the cock it may be turned over an hour or so before loading.

The rate of evaporation depends on the temperature, dryness of the atmosphere, wind, and the total bulk. Therefore, it is very variable and under favourable conditions is usually rapid. In parts of the North, in making grass hay, it is often possible to cut in the morning and stack before nightfall. The evaporation of moisture produces a bleaching action which reduces the original green colour; if the material is wet and dried again it is still further reduced if not entirely bleached. The direct rays of the sun will also have a bleaching effect. During the process of curing, fermentative changes occur in the mass whereby a large proportion of the carbohydrates which are present in the material before it is cut is rapidly resolved into soluble substances; aromatic compounds, probably due to the presence of essential oils, are formed, which, though perhaps of no great food value, impart flavour and render the hay more palatable and inviting.

The action of rain and dew on hay when curing is to bleach out these soluble and aromatic substances with a corresponding loss of nutriment.

In experiments carried out in Great Britain, it is recorded as much as 20 per cent. of nutrients in fresh grass are lost by weathering. In addition to loss of nutriment the wetting of hay tends to the production of objectionable moulds, which cannot be afterwards go rid of, and which, while making the hay distasteful, are also at times a cause of digestive troubles.

Brown Hay.

Brown hay is obtained by cocking before sufficient wilting has taken place or by stacking when insufficient moisture has been dried out, as a result greater fermentation produces sufficient heat to brown or even char the mass. The darker the colour the lower the nutritive value. This class of hay, though favoured by some users, has nothing to commend it, unless as in the case of some coarse fodders with harsh thick stems, that, owing to combined heat and moisture, are thereby softened and rendered more palatable. On account of the loss of nutrients in curing, brown hay is not so valuable as the bright green sample, and its production is not commended except in weather that will not admit of curing in the proper manner.

Successful Hay Making.

To sum up, the necessary operations in successful hay making are:—

Cut at the proper time when all dew is off.

Rake into windrows or into cocks as soon as sufficient wilting occurs.

Allow as much access to air as possible, without direct sunshine, amongst the curing mass.

Leave not more than from 10 to 20 per cent. of moisture in the finished stack.

Prevent wetting by dew or rain at any time after cutting.

In storing for home consumption it is desirable to build stacks convenient to where feeding is expected to be carried out, at the same time paying attention to the prevention of damage from fires by clearing or ploughing a break at a sufficient distance all round, and from floods by building above flood level.

While stacking hay it is a common practice to sprinkle salt and sometimes lime amongst it; the addition of these substances tends to check fermentation and to prevent the growth of moulds. In properly cured hay these additions are not essential, and their use can only be recommended when incompletely cured hay has to be stored in bad weather, or in a district where stock do not get all the salt they require.

CONCRETE FEEDING FLOORS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Visiting a large suburban piggery recently, the writer drew attention of the owner to the necessity of constructing a concrete feeding floor on which to feed the pigs that were not kept in sties and that were fed from troughs scattered here and there through the yards. It had rained during the morning of the visit, and the mud was ankle deep in the yard where the pigs were about to be fed. As it happened it was the midday feed (a sort of light sandwich luncheon), and consisted largely of greenstuff, cabbage, cauliflower, and lettuce leaves, carrot, and parsnip tops, a few potato peelings, &c. The farmer simply walked about the yard emptying the contents of the pig tin on the ground on top of at least three inches of mud, and in the mad scramble that followed as soon as the sows heard the dinner bell, there were soon no greenstuffs to be seen; what had not been devoured had been trampled in the mud, and of course the hungry ones were ploughing their noses through the slush and slime in search of some remnants of the midday lunch.

To say that the system was filthy and disgusting did not seem to worry our friend for he was content to let the sows take their chance; if they survived they were "good 'uns," if they failed to make good on the menu, well, they were simply thrown out as unprofitable and some other poor creature got the job.

Now all this filth and stench can be avoided, and it is guaranteed that a concrete feeding floor will pay for itself in a month, and the pigs will benefit in a hundred different ways. There is not only greater gain in weight if the pigs feed on a floor where the food cannot be lost, and where accumulation of filth can easily be prevented, but there is less loss of good food, and a greater profit from that which is consumed. We must also consider sanitation if we expect our pigs to be healthy. Concrete floors are hard, easy to clean, and can be flushed or hosed over in a few minutes after use, a bucket of disinfectant sprayed or thrown across the floor will keep it clean for next feed. The labour of feeding and keeping the yards in order is also considerably reduced, and this is a proposition that must be faced.

The size of the floor will of course depend on the number of pigs to be fed, hence no standard size can be recommended. In shape, the floor may be oblong or square. The latter is preferable. Make it big enough to accomodate about thirty sows or fewer than this if need be. Use a 1-2-3 or a 1-2-4 mixture in making the concrete, and in thickness have the floor laid on a good solid foundation allowing a clear 4 inches of concrete for the floor. The sides should be protected and this is best done by excavating the soil for a depth of say 8 inches all round and about 4 inches wide, and making a shallow foundation and protecting wall all round, this might be levelled off on the surface or formed into a shallow half round drain. The object of this outside wall is to prevent the pigs from rooting under the floor and heaving it up as they are liable to if it is left unprotected. The floor should have a fall from the centre to the outside of, say, half an inch per foot. The gutter round the outside could be connected with a drain to carry away the washings and thus enable the whole to be kept clean. If the yards are large enough it is an advantage to fence the feeding floor off, the food can then be scattered over the floor and be all ready for the pigs when the gate is opened, and the meal begins. These concrete feeding floors are a necessity on every pig farm, and their cost is a mere detail when compared with the advantages they offer.

A USEFUL WEED.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, writes:—"Under separate cover I am posting a specimen of a weed sent me from the Tableland and which I have not observed before. It is said to be growing prolifically amongst Paspalum. I would like it identified and to know whether it has any fodder value."

The specimen was submitted to the Government Botanist (Mr. C. T. White), who reports:—"The specimen forwarded is the "Black Medic" or "Minette" (*Medicago lupulina*), an annual plant, a native of the Mediterranean region. It is widely cultivated as a fodder and it should prove quite a useful addition to the Tableland pastures. It has not before been met with in Queensland, but for some years past has been naturalised in some of the Southern States. In the United States it is reported to be widely grown as a pasture plant in wet meadows and on stiff clay soils, where clover or lucerne will not thrive.

PRODUCTION OF NEW VARIETIES OF WHEAT.

By H. C. QUODLING, Director of Agriculture.

Breeding and evolution of new varieties of wheat to suit Queensland conditions have been carried out for a number of years by the manager of the State Farm, Roma, Mr. R. E. Soutter, who specialises in the work.

Wheatgrowers are faced with their share of problems, not the least of which is the choice of varieties calculated to give a maximum return under the varying conditions of soil and climate which have to be reckoned with over a series of seasons.

In catering for requirements the wheatbreeder has no light task; to him an increase in productivity is not by any means an insurmountable difficulty. Many other problems obtrude themselves. Those relevant to a general improvement in plant and in field characteristics, in yield and in milling quality would be of little value were they not associated with a capacity on the part of the new variety to resist rust. *In this State the rust problem transcends all others in importance,* a fact brought home to growers on many occasions by losses amounting in the aggregate, even in the case of one season only, to tens of thousands of pounds sterling. To avoid these losses and to stabilise the industry as far as production is concerned, is a matter which the Department of Agriculture had taken an active interest in for a lengthened period—actually more than a quarter of a century. Co-ordinated effort on the part of its officers is doing a great deal towards the improvement of existing varieties. Much, however, remains to be done. Actually what is needed at this stage is the whole-hearted co-operation of the growers who could do a great deal by experimenting with some of the new varieties, so that comparison with commonly grown wheats may be made on individual farms.

Years of painstaking study and work on the part of the wheatbreeder, based as it is on scientific principles, would be of little avail unless an organisation existed to carry out the work to its logical conclusion.

Apart from the milling and nutritive tests of new varieties carried out by the Agricultural Chemist, the second and subsequent field tests which a wheat, carrying the imprimatur of the breeder, has to go through in this State before it is considered advisable to try it out in general cultivation, are made by officers of the Field Branch of the department, who are trained observers. The duty of these officers is to establish a series of experimental wheat plots in different districts and to keep the group of new crossbred wheats under close observation and collate data. In this way the behaviour of their plant charges under varying conditions and environment can be ascertained. A gradual selective process is followed up by means of the elimination of the unfit, until a stage is reached admitting of field trials with a few of the best types. These, if satisfactory, provide a sufficiency of seed to distribute by sale, after grading, to growers. Seasonal and other exigencies which have to be met with, promptly determine whether a new wheat deserves recognition commercially. Judged by practical men in this way the merits and demerits of a variety soon manifest themselves.

The wheat briefly described have passed through their novitiate and are being offered to growers at 9s. per bushel freight paid from Brisbane to any railway station in the recognised wheat belt.

When ordering, a second or third choice should be made to avoid disappointment.

Cheques accompanying orders for seed should have exchange added and be sent to, and made out in favour of, the Under Secretary for Agriculture, Brisbane.

A limit of 6 bushels to an individual purchaser has been fixed for any one variety.

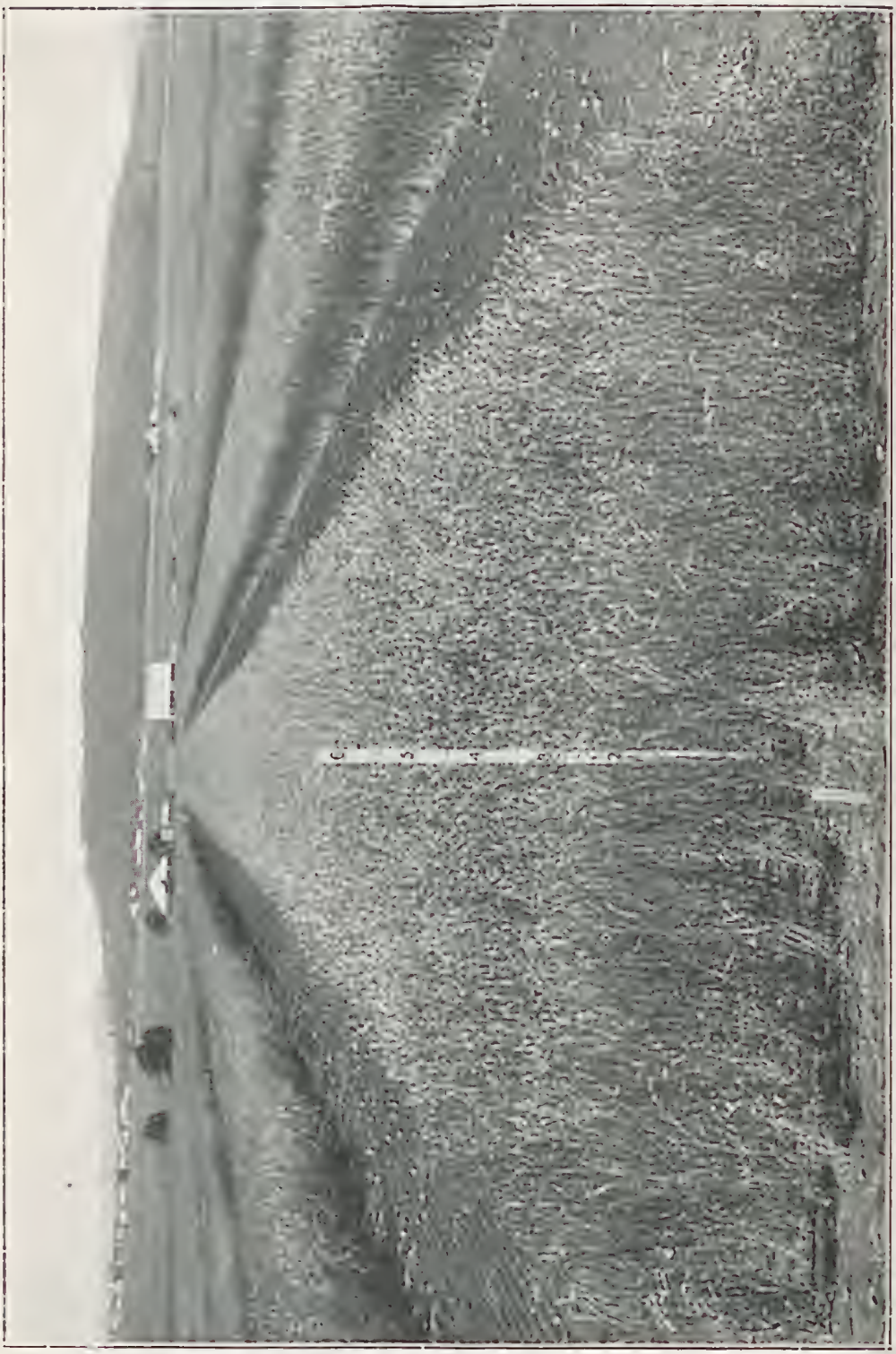


PLATE 31. A PLOT OF BIDDI WHEAT ON MR. O. HEINEMEIER'S FARM, ALLORA.

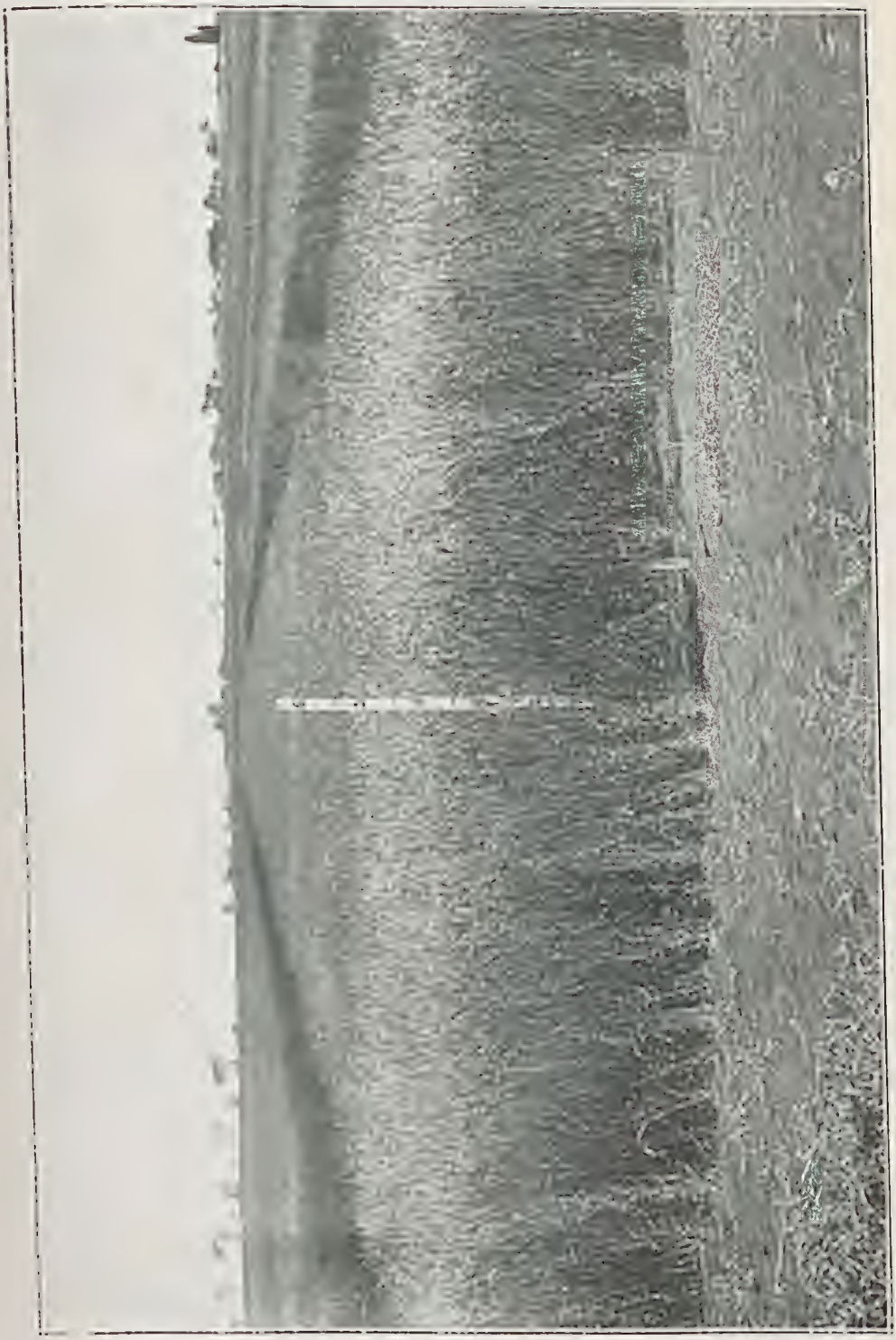


Plate 52.—A Plot of "Marco" Wheat. Mr. O. Hentschell's Farm, Allora.

Characteristics Necessary in a Wheat to Insure its Popularity with Growers.

Capacity to resist rust and Bunt (smut). Ability to withstand dry spells. Good milling quality, preferably with a hard textured, medium-sized, weevil-resistant grain. Firm, upright, strong walled straw; not inclined to lodge. A minimum amount of flag, preferably of a firm, somewhat erect nature. A good strong root system. Capacity to mature quickly, and with a minimum period of time between flowering and ripening. Evenness of ripening. Level-headedness of crop. A good, well-developed ear in which the grain does not readily discolour or bleach. Capacity to hold grain without shedding it in the field. It must be easy to harvest, and not too tough to thresh. Prolificness.

Descriptions of New Crossbred Wheats.

"Waterman" (S.E. x W. 8).—A Soutter's Early and Warren cross; white chaffed, non-bearded. Straw pale yellow, willowy in character. Grain slightly above medium size, smooth skinned, semi-translucent, medium hard.

"Watchman" (S.E. x W. 79).—A Soutter's Early and Warren cross; non-bearded, smooth white chaff, pale yellow straw. Grain round, plump, smooth skinned, creamy white.

"Redman" (B. x Man. 10).—A Bunge-Manitoba cross; white chaffed, non-bearded with a tapering head. Straw of medium fineness but tough. A fair stooler. Grain red, medium hard, full-bosomed.

"Redchief" (B. x M. 22).—A Bunge-Manitoba cross, non-bearded, white chaffed, having a tapering head; moderate stooler; straw tough but inclined to fineness. Grain red in colour; slightly under medium size, smooth skinned and medium hard, bright.

"Ringer" (B. x M. 12).—A Bunge-Manitoba cross; non-bearded, white chaffed, of medium stooling habits, straw willowy, grain of medium size, red in colour, plump and medium hard.

"Radio" (B. x Man. 29).—A non-bearded, white chaffed variety of medium stooling habits. Straw tough and willowy. Grain red, somewhat narrow; of medium hardness and slightly under medium size.

"Redskin" (B. x Man. 16).—Very similar in all characteristics to "Radio." Grain red, medium-sized, plump, and bright.

"Marco" (B. x Marquis).—A white chaffed wheat, resulting from the crossing of Bunge with Marquis, of fair stooling habits, straw of medium fineness, but tough. Grain red in colour; short and plump, and of medium hardness.

"Pinto" (B. 2 x Flo. T. 4).—A Bunge 2 and Florence cross; white chaffed wheat, tip awned and with a tapering head; straw inclined to fineness but tough. Grain above medium size, plump, red, medium hard, and of good appearance.

"Buffalo" (B. 1 x Flo. 2).—A non-bearded white chaffed Bunge-Florence cross, with tapering head; straw of medium fineness. Grain reddish in colour, full-bosomed, and medium size and hardness.

"Amber" (B. 2 x Amb. 22).—A Bunge 2 and Amby cross. A white chaffed, fine strawed variety; good stooler. Grain of medium size, plump, pale red in colour, attractive, with a smooth fine skin.

"Amberite" (B. 2 x Amby 22 Sel. 1).—A Bunge 2 and Amby cross; white chaffed, fine strawed, fair stooling variety. Grain of average size, plump, attractive, pale red in colour, with a good skin.

"Beewar" (Bunge 2 x War. 2).—A Bunge-Warren cross, white chaffed; straw willowy and of medium fineness. Grain white, of medium size and softness, plump, smooth skinned.

Note.—All the above wheats show slight signs of weathering, due to the wet season when ripening.

Period Recommended for Sowing on the Downs.

Third week May to end of first week in June—

Waterman, Redman, Redchief, Ringer, Radio, Redskin, Marquis, Amber, Amberite, and Beewar.

Second to third week in June—

Watchman, Pinto, and Buffalo.

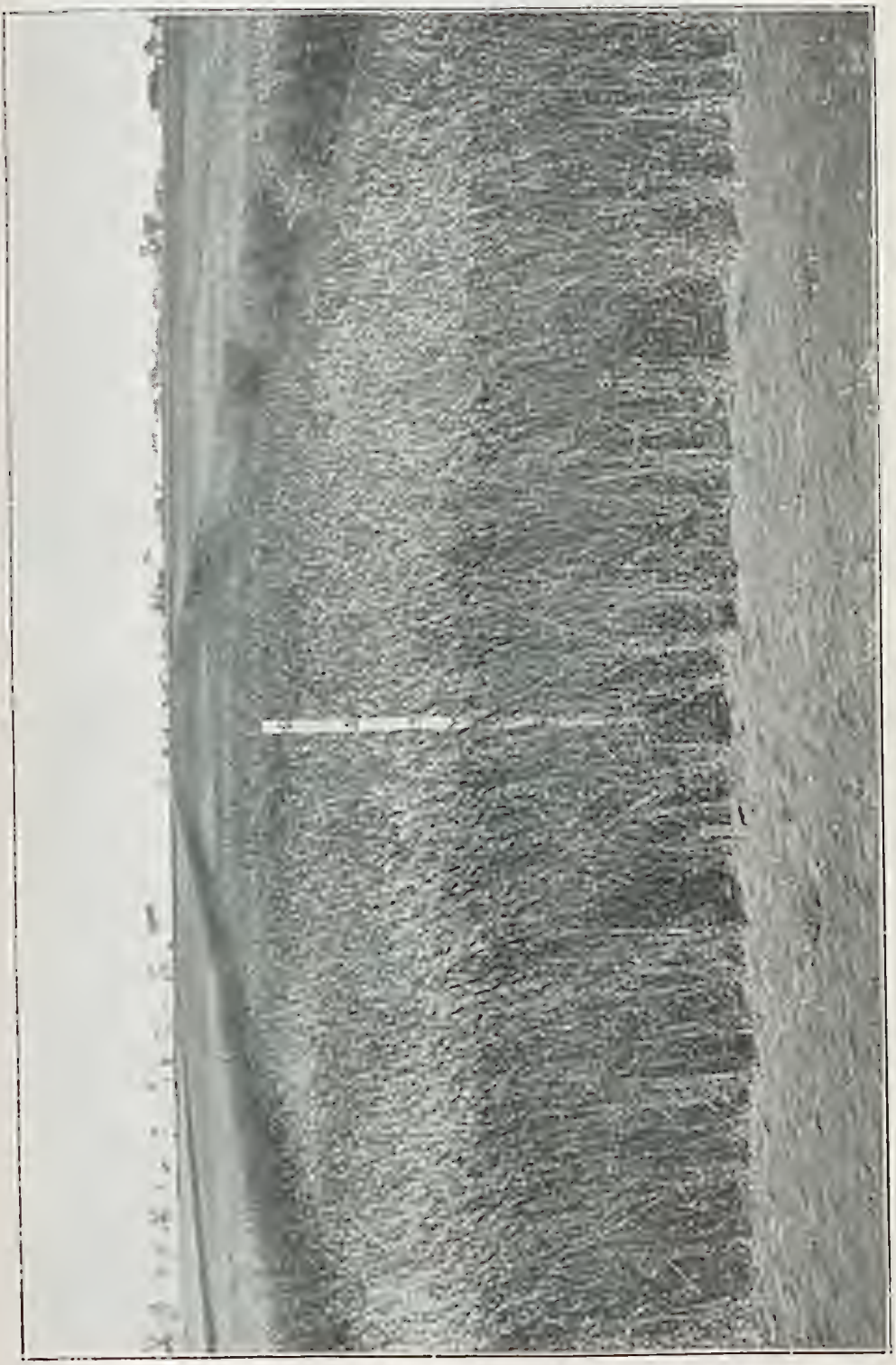


Plate 53.—A Piece of "Rutland" Wheat, on Mr. Hennessy's Farm, Aubigny.

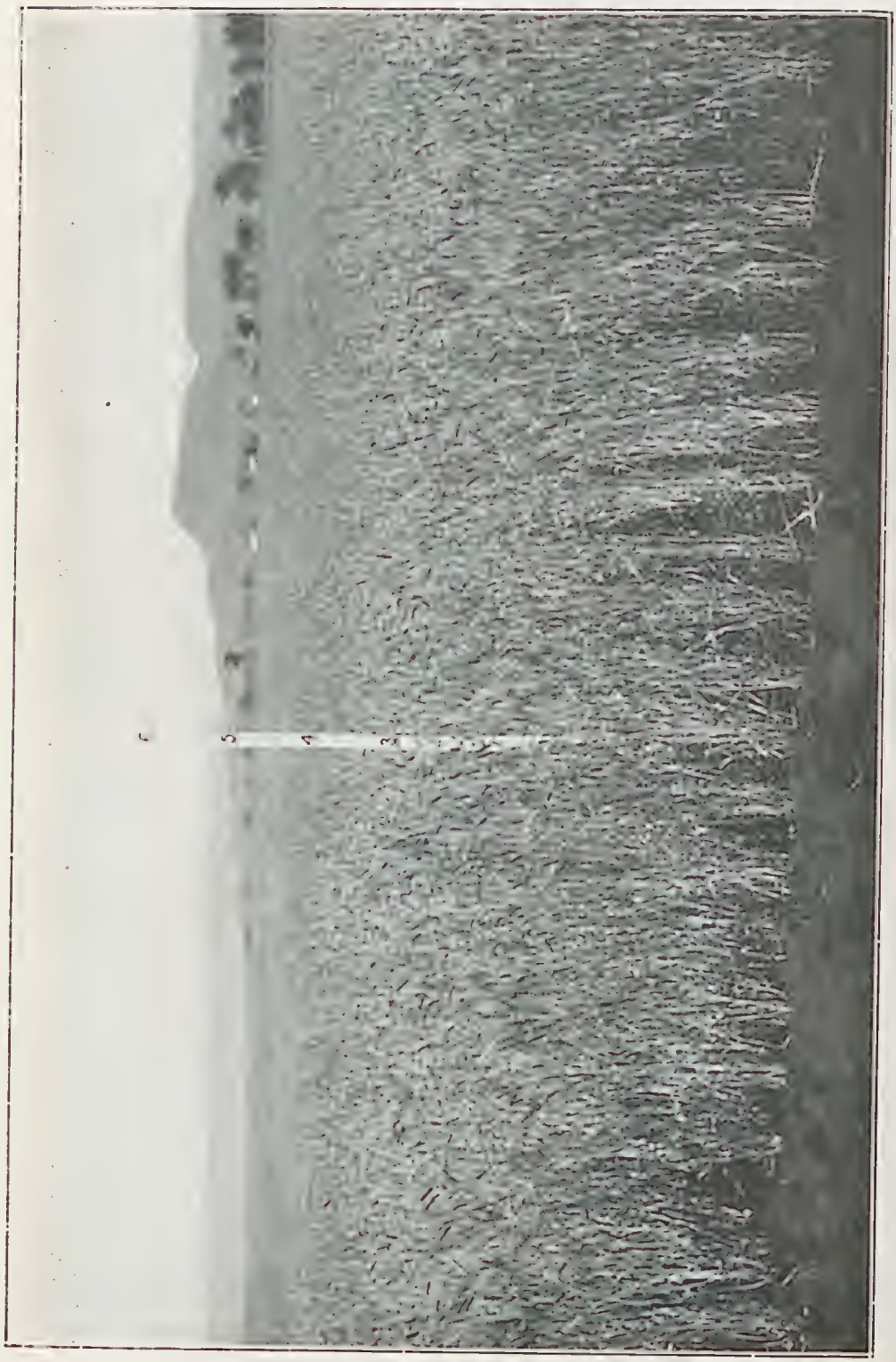


PLATE 54.—A PADDOCK OF "THREE SEAS" WHEAT (CRETAN X COMEBACK X CRETAN).

PLATE 55.—A ROMA CROSSBRED, $BUNGE_2$ x $WARREN_2$—NAMED "BEEWAR."

PLATE 56.—A ROMA CROSSBRED WHEAT, BUNGE x MANITOBA 29—NAMED "RADIO."

PLATE 57.—A CLOSE-UP OF "MARCO" WHEAT, A ROMA CROSSBRED.

PEATE 58.—A CLOSE-UP OF "BUFFALO" WHEAT, A ROMA CROSSBRED.

Plate 59.—A Roma Crossbred—Bunge$_2$ x Florence T4—named "Pinto."

Plate 60.—A Close-up of "Amber" Wheat, a Roma Crossbred.

QUEENSLAND AT WEMBLEY.

Mr. H. W. Mobsby, F.R.G.S., F.R.S.A. (Artist and Photographer, Department of Agriculture and Stock, Queensland), State organiser of the Queensland exhibits for the British Empire Exhibition, 1924, and who was appointed by the Australian Federal Commission as display officer at the Australian Pavilion, Wembley, returned to Queensland recently. Speaking generally of the Exhibition at Wembley, Mr. Mobsby said that it had achieved its object in directing attention to Australia commercially, and in attracting prospective migrants and tourists. It had enabled Queensland particularly to show its wonderful possibilities. Enquiries made it clearly evident that the British buyer is interested in Australia and desires to become a purchaser of our products. The Exhibition at Wembley was open from 23rd April to 1st November, and in the course of that period admissions numbered 17,403,119 persons. On the opening day the attendance was 150,000, and on the last day, 1st November, 94,499, although it was an extremely wet and foggy day. One of the biggest days was Whitmonday, when the admissions totalled 321,231. To the 20th August the total admissions were 10,285,000, of which 6,500,000 was the estimate of visitors who passed through the Australian pavilion. On a quiet day the result of a check taken at the doors showed a total of 11,000, whilst on a busy day, 17th May, 40,000 passed through the Commonwealth Pavilion.

The rush and turmoil of the month, early and late, prior to the opening day of a great exhibition is hard, for those unacquainted with the work, to realise, especially the day and night immediately before, when final preparations are in full swing.

Australia a Good Place to Live in.

"Australia, producing all this, must be a good place to live in" was an expression often heard. Our pavilion, said Mr. Mobsby, opened on time on 23rd April, but, unfortunately, our cotton, sugar, and tropical trophies, the designs of which were approved and decided on in Australia by the Commission, were not used. Other primary and manufactured products, such as beef, mutton, butter, cheese, minerals, timbers, grains, canned fruits, meats and preserves, dairy products, and flour, on the whole, were attractive to visitors and prospective migrants. A more practical result would have been obtained, however, had the proportion been 75 per cent. exhibits and 25 per cent. lay-out and decoration instead of the reverse. The arrival of the Commissioners, Hon. A. J. Jones, M.L.A., Minister for Mines, and Mr. Robert Joyce, Commercial Commissioner, made matters better for the exhibitors. Under their direction everything was displayed or rearranged, especially the cotton, sugar, timber, silk, honey, and other exhibits, which were deserving of more prominence—a matter that was apparent to many Queensland visitors.

Migrants for Qeeensland.

Immigration being a Federal matter, prospective migrants were referred to Australia House. Mr. Mobsby was instrumental in securing many for Queensland who booked their passages to this State direct. They were all fine types of settlers. Many inquiries were also made by those who wished to include Queensland in a tourist itinerary.

An Educational Centre.

As an educational centre Wembley proved itself a success. Organised parties of school children toured the grounds and buildings daily, gaining a vivid conception of the resources of the Empire, and the Australian States in particular. The exhibits as displayed at the 1924 Exhibition have been in the main held for 1925, such as the products of the Queensland State Cannery. These exhibits should, in Mr. Mobsby's opinion, be supplemented by large supplies for direct selling in the Pavilion. Canned pineapple in slices and jam were very popular. A strong demand for these products was created, and continued long after the stocks had been exhausted, thus showing the advertisement these goods gained. Honey is another product that Queensland should take advantage of in reopening a market in Great Britain, and with proper attention to grading and bottling this should command a ready sale, judging by the so-called "Australian Honey" that sold well. Very numerous inquiries were made by people interested in land settlement and industrial schemes, and other prospects in Queensland.

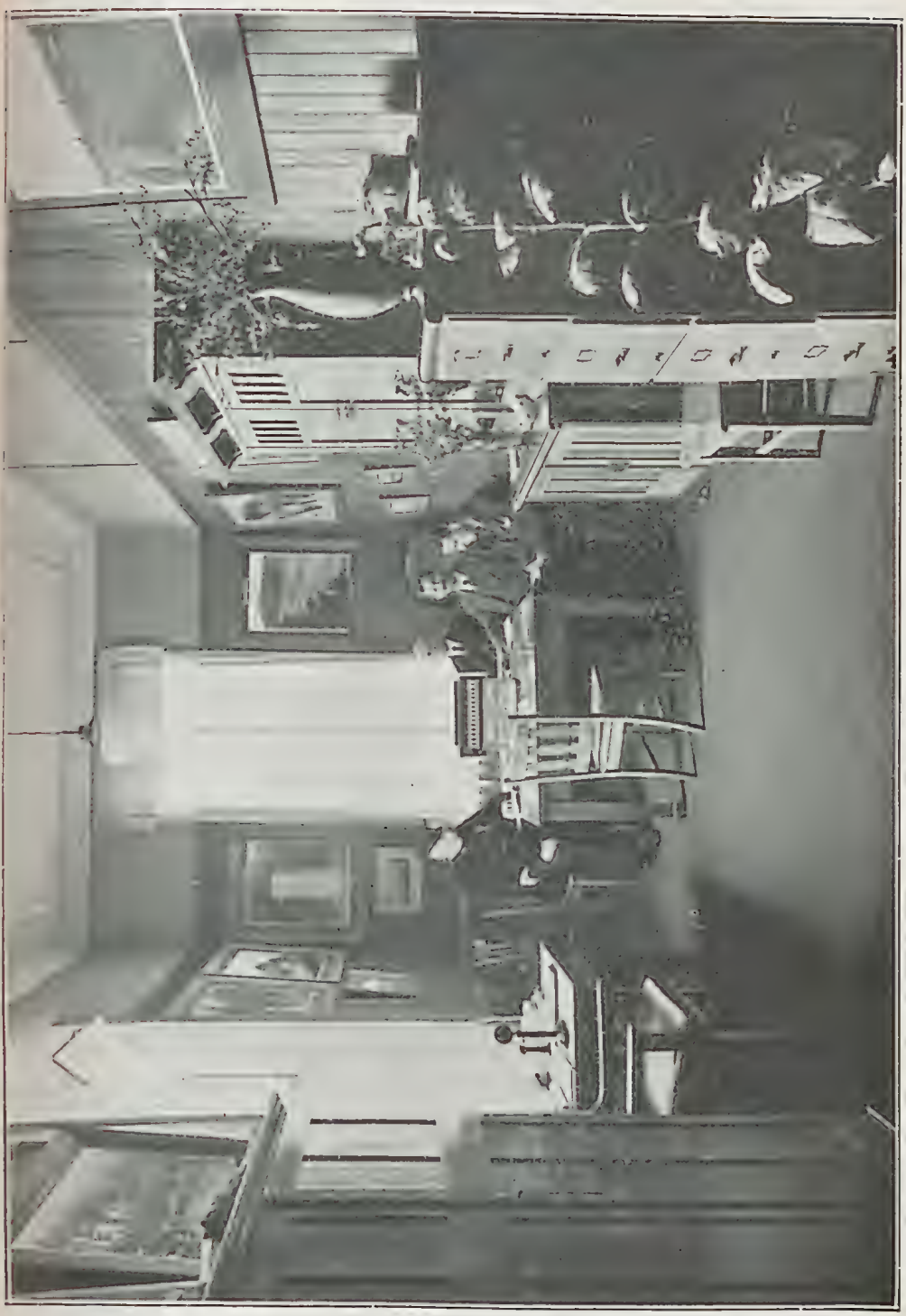


PLATE 61.—QUEENSLAND ROOM, AUSTRALIAN PAVILION, BRITISH EMPIRE EXHIBITION, WEMBLEY, 1924.

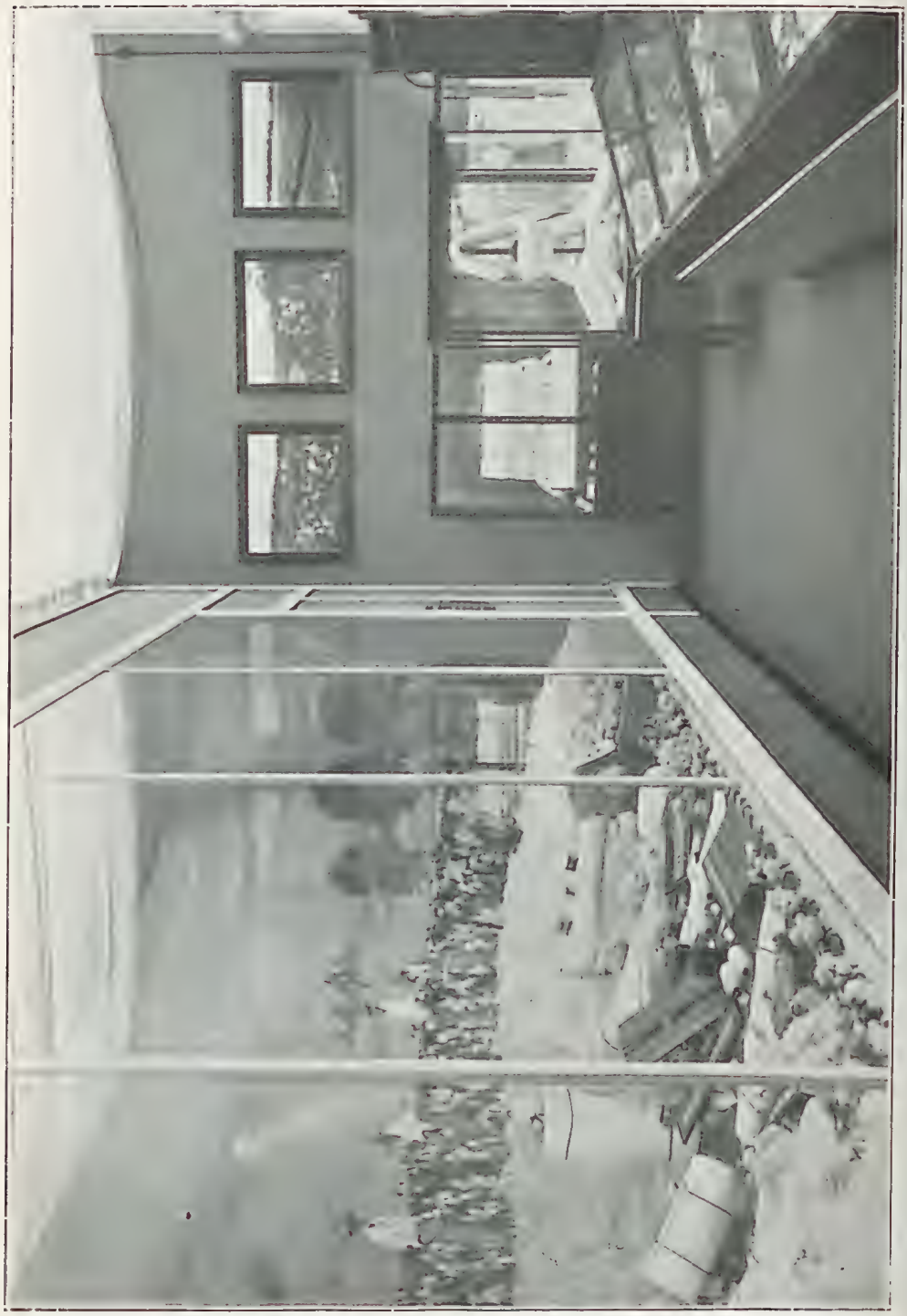


PLATE 62.—DISPLAY OF COTTON (QUEENSLAND).—RAW MATERIAL TO FINISHED CLOTH. AUSTRALIA PAVILION, WEMBLEY, 1924.
Queensland produces 91 per cent. of Australian Cotton.

Photo. by Campbell-Gray.

Comment on Queensland Cotton.

Favourable comment on Queensland cotton was common from people who were able to judge—Lancashire spinners and cotton men from Mexico and America (one had grown cotton in South Africa for fifty years). Queensland Durango was often classed by them as better than any they had seen before. Spinners whom Mr. Mobsby met strongly favoured the annual crop as against ratoon. Mr. Mobsby found also on inquiry of those from Africa and Mexico that they do not favour ratoon cotton-growing. The cotton cloth exhibited made from our Queensland cotton was much admired by the women visitors. The president of the National Federation of Textile Works Managers, from whom Mr. Mobsby received a visit, was particularly impressed with the quality of Queensland cotton.

As the Australian section of the 1925 Exhibition will probably be under only one Commissioner, and as Australia House will control the Pavilion, it is a pity, in Mr. Mobsby's opinion, that each State will not have an officer to give information and follow up the good work of 1924. Without this he is afraid that the interests of individual States, particularly Queensland, will suffer. Queensland exhibitors should, in his opinion, have preference over concessionaires, who have naturally no really permanent interest in Queensland in respect to the sales of our products in the Australian Pavilion. Under such an arrangement the proceeds of sales could be credited to our own exhibitors.

LEAF ROLL OF POTATO.

The symptoms of leaf roll are somewhat varied, according to the stage of infection reached. Two American scientists, Schultz and Folsom, have shown that the disease is spread slowly from plant to plant in the field by aphids—possibly also by other sucking insects. Once a plant has been infected, the contagion is readily carried over from season to season in the tubers, and practically all the tubers from an infected plant convey the disease when used as seed.

In the first year of infection very little sign may be seen on the leaves—possibly a certain amount of curling of a few leaves. Tubers from plants which have been infected give rise in the next year to plants showing marked rolling of the lower leaves, and possibly of some of the upper leaves. In addition, a proportion of the leaves display a form of yellowing, or chlorosis. This is particularly marked along the rolled margins of the leaves. In varieties where pigment is present, the rolled margin may be marked with purple. The manner of rolling is characteristic. The sides of the leaves curl inwards from both sides, so as to form two rolled cylinders parallel with the midrib. If the plant so affected is examined, the seed tuber may be occasionally found intact. In addition, the new tubers will be found to be few in number and greatly reduced in size.

In some cases the stolons, or stalks, which connect them to the plant are shortened. The disease interferes in some way with the manufacture and transfer of the starch from the leaves to the tubers. If tubers from affected plants be again sown, there may be a proportion of marked failures, and in any case a serious depression of yields results.

For control a system of selection of hills must be practised. The best way to secure good potato seed is to raise it on the farm under one's own observation. Farmers who have large areas to plant should maintain a seed plot. To commence this, they should select only tubers from hills which are quite free from leaf roll, and which are not in proximity to affected plants. These seed tubers should then be planted in a seed plot situated some little distance from the main or other potato crops, and in the following season all plants in this plot which show leaf roll should be noted and removed promptly, as soon as they are recognised. The remaining tubers will provide the seed for the main crop in the following year, with the exception of the small number necessary again to maintain the seed plot.

If this system of two-year selection of the seed potatoes was practised, or a known disease-free strain were propagated in the seed plot, and rogued only one year, it is certain that much higher yields would be obtained. The method would not be costly, but would involve attention to that most vital of all potato-growing problems—the selection of the best seed. The present haphazard methods of securing seed from the crop without any knowledge as to whether the tubers come from leaf-roll plants or not will only result in further depression of the yields.

The foregoing has a seasonable significance for growers who may be selecting seed from a late-sown patch.

SHEEP ON THE CENTRAL COAST.

Mr. W. G. Brown, Instructor in Sheep and Wool, reports:—At the request of the L.P.A. presidents, I visited the Bajool and Mount Larcom districts to inspect the land of the farmers and the possibilities of sheep raising in that part of Queensland.

I found that the great bulk of the land was scrub land which, when cleared, was sown with Rhodes grass and wherever I went there are now splendid stands. I lectured at Bajool to about thirty farmers and at Mount Larcom to twenty or more.

There is a strong movement all over the coastal areas up to Cairns in favour of keeping at least fifty sheep, and the wonder to me is that it has never been done before. There have been several small flocks in both districts for some years and they have invariably done well.

The Mount Larcom district is specially suited to sheep. The land is of high quality and the rainfall adequate. There is abundance of good water. Rhodes grass grows to perfection.

Messrs. Fairweather, of Bajool, have been running 250 ewes on 25 acres of Rhodes since the beginning of November last, and although they were poor when put on the place they are now in excellent condition. They are about to lamb and from appearances should give a drop of at least 80 per cent.

There seems to be a keen desire on the part of the farmers of both districts to keep small flocks of sheep as a side line. Three men who have added sheep to their farm stock and whom I met are very satisfied. Mr. Beck, of Mount Larcom, realised 13s. 6d. per head for wool alone. Mr. Aden, of Bajool, realised 13s. per head for wool alone, and so on. My statement that one ewe will return £1 per annum in wool and lamb can thus be shown to be very conservative, considering that fat lambs are scarce and are bringing up to 35s. per head at Enoggera yards. This at from 6 to 9 months old.

I consider Mount Larcom to be eminently suited for sheep, if care be taken against dogs, the greatest drawback to sheep keeping in Queensland. I advise, in the absence of a dog-proof fence, shepherding and yarding at night. A boy fourteen or fifteen years old can look after 700 or 800 sheep, or an old age pensioner could do the same. There is no heavy labour attached to sheep farming excepting at shearing time. The other drawbacks are stomach worms and flies. These, however, may be dealt with in the manner recommended by the Department.

In can only reiterate that sheep will do admirably in both the districts I have just visited.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

The accompanying illustration shows the lower part of the stem of *Cryptocarya fovedata*, a tree which is common in the ranges in South-Eastern Queensland. It has been observed to be common in the ranges of the Killarney district, the National Park, Macpherson Range, and Mount Mistake. The leaves of the tree are small and have globular, wart-like swellings on the upper surface where the chief lateral veins join the midrib. The specific name, fovedata, originates from these wart-like swellings or foveoles. The wood resembles that of an allied tree, the Bolly Gum, but is finer in texture and heavier.

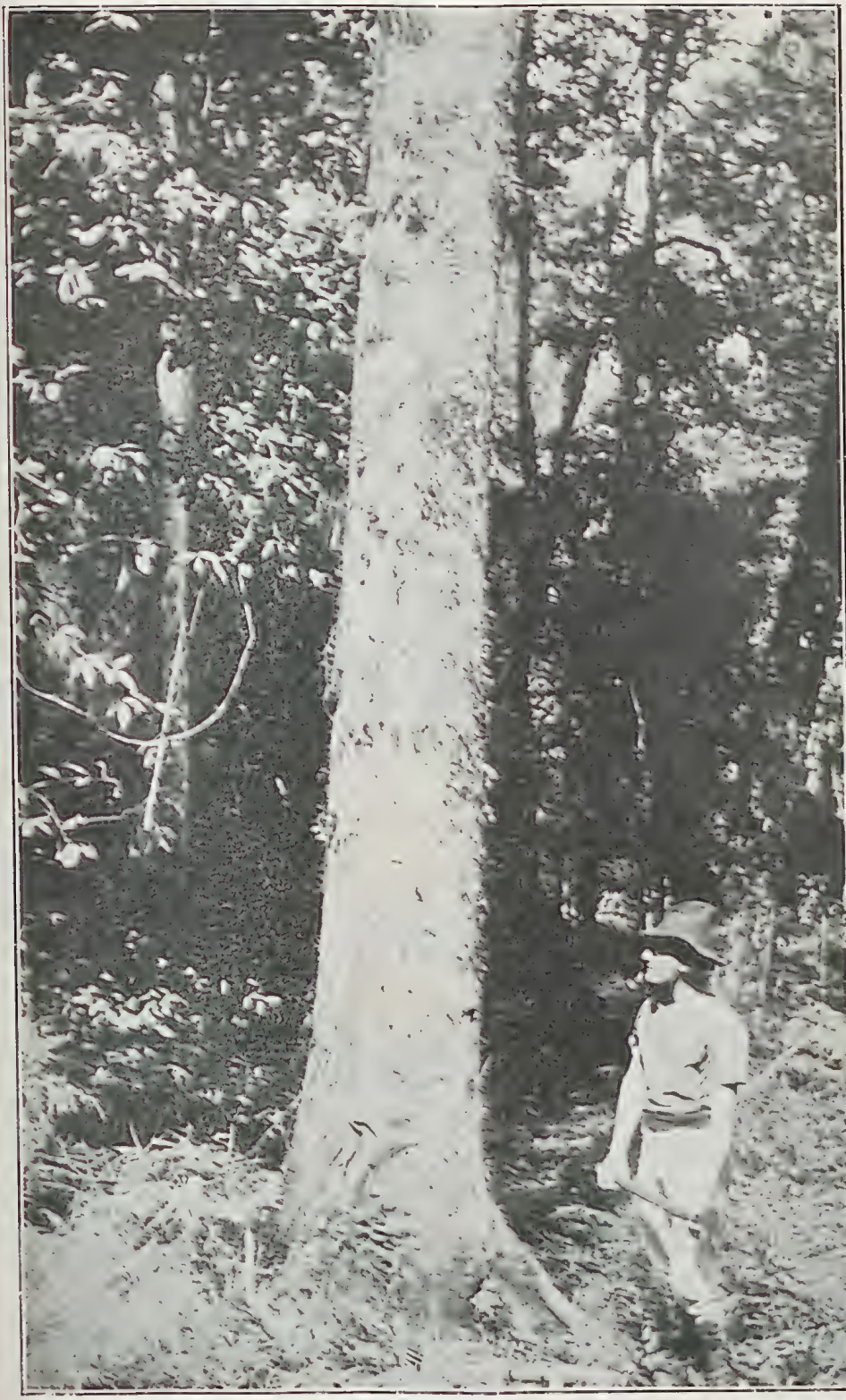


PLATE 63.—CRYPTOCARYA FOVEOLATA.

A tree in the Ranges eastward of Emu Vale in the Killarney District.

CASSAVA—MANIOC OR TAPIOCA.

By N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

The Bitter Cassava, "Manihot Utilissima," known by its yellowish roots and stem, and Sweet Cassava, "Manihot Aipi," with reddish roots and stem, though classed as distinct species, are held by some authorities to be but variations of one original species.

This possibly is true, as there are many varieties of both, in countries where it is extensively cultivated, that approach so closely in appearance as to make it extremely difficult, if not impossible, to distinguish any difference in the species.

The species is indigenous to Tropical South America, where it has been cultivated for human food from very early ages. From there it has been introduced into most tropical countries and now forms a staple article of diet for many races.

For human consumption it is prepared in many different ways. As a vegetable and as a flour; while we are most conversant with it in its commercial form of tapioca.

The roots of both species contain a poison (hydrocyanic acid), a greater quantity occurring in the bitter variety than in the sweet. This poison occurs mainly in the skin of the roots and is easily dissipated by heat, but, nevertheless, care should always be exercised in preparing the roots for human consumption, and they should be used, especially if not quite mature, shortly after lifting.

While it is necessary to call attention to the poisonous properties, it has been observed that fresh roots in different stages of growth are eaten by pigs and predatory animals without any apparent ill effect.

Propagation.

The plant is a semi-shrubby perennial with slender, erect stems, and grows from 6 to 9 ft. high. It is propagated from cuttings of the stem 8 to 12 in. long, preferably from firm new wood, or wood of under twelve months' growth; the younger the wood the more suitable for propagating sets.

The soil most suited for Cassava is a well-drained, sandy or otherwise friable loam with good humus content, which will admit of the free expansion of the roots and of easy cultivation. It should be deeply worked by ploughing where a depth of soil as in alluvials occurs, or ploughed and subsoiled where the organic matter of the soil does not obtain deeper than the depth of ploughing.

After a thorough preparation of the soil, as for sugar-cane, drills are drawn out similarly from 4 to 6 ft. apart and single sets planted therein at intervals of from 3 to 6 ft.; width of spacing being governed by the variety and conditions under which it is to be grown.

The wider spacing is recommended on the richer soils of the coast where conditions for growth are most favourable, with somewhat closer spacings on the poorer lands, as well as on the soils at higher altitudes.

After planting the sets, which should be inserted in the soil for about two-thirds of their length, either upright or at an angle of 45 degs., the young plants, provided conditions are favourable, should appear above the surface in about a fortnight.

Cultivation.

Cultivation consists in keeping the soil well stirred and free from weeds until the plants are about 2 ft. high. It is an advantage when cultivating to throw a little soil in towards the plants, leaving a depression along the centre between each row of plants similarly as in sugar-cane cultivation; a high hilling of plants is not necessary.

The growth of the tuber is stimulated by checking the growth of the plant upwards by removing some of the terminal buds, thus throwing the strength of the plant downwards.

Where Cassava May be Grown.

The climatic conditions most suitable for the Cassava plant are such as obtain in the Northern coastal districts with heaviest average rainfall. In these districts, with suitable well-drained and rich soils, under humid and warm conditions, very heavy crops should result.

At Cardwell and on the Bloomfield River instances are recorded of from 80 to 90 lb. of roots being obtained from a single plant. The general average under proper conditions can be estimated at quite 20 tons to the acre, but on poorer soils and on drier areas the yield may only be 10 tons.

Plantings can be made at any season of the year, but are considered to give the best returns when planted between spring and autumn. Under favourable conditions the crop should be ready to lift in eight or ten months after planting, but the roots

Photo.: G. B. Brooks.]

PLATE 64.—BITTER CASSAVA, TWO YEARS' GROWTH.

Photo.: G. B. Brooks.]

PLATE 65.—MANIHOT UTILISSIMA, OR BITTER CASSAVA.

will not deteriorate if left for twelve months or even longer. Some varieties even take up to fifteen months to attain full maturity.

When lifting the roots, which sometimes grow to 3 ft. or more in length with a diameter of 5 or 6 in., the stem should first be cut off level with the ground, when, if needed later on for sets, suitable portions could be buried a foot deep in loose soil in a shaded, but not too moist, situation. This procedure will keep the stems fresh for a considerable time.

Its Economic Value.

Cassava is recognised as the cheapest source of supply of starch, which is present in the fresh roots to the extent of up to 34 per cent. The quantity or percentage of starch will, of course, vary during the growth of the roots, but can be expected to be at its maximum during the drier part of the year, between June and December.

In this State a fair quantity of Cassava was grown in the days of kanaka indented labour, but since then, apart from some of the aboriginal mission stations, it has rarely been cultivated as a crop, though recommended by this Department as of value for pig feed in certain localities.

Cassava and Power Alcohol.

In the production of power alcohol Cassava, as a crop to supplement molasses and other components, should be largely grown, especially as it thrives to greatest perfection in the districts which produce the heaviest cane crops. Though the price per ton for the roots cannot be high, owing to its regulation by the price of the resultant alcohol with imported petrol, the total return per acre should allow from this source an appreciable profit on cultivation, while the by-products after the alcohol has been obtained should have some small additional value as a stock food.

What Analyses Show.

The following analyses from Henry's "Feeds and Feeding" show of digestible nutrients in fresh roots:—Crude protein, 0·6 per cent.; carbohydrates, 26·4 per cent.; fat, 0·2 per cent.; nutritive ratio, 1: 44·7.

The same authority gives in analyses of the dried roots:—Crude protein, 1·4 per cent.; carbohydrates, 77·4 per cent.; fat, 0·2 per cent.; nutritive ratio, 1: 55·6.

It is evident from these analyses that Cassava roots alone are very ill balanced for stock food, owing to the preponderance of carbohydrates, and that to feed economically it would be necessary to add quantities of foods rich in protein.

A Gross Feeder.

Cassava is an exhausting crop on soil, and should be grown in rotation with other crops, at the same time keeping the soil in a high degree of fertility by the use of fertilisers and the ploughing under of suitable green crops. Potash is the chief plant food constituent required and should be present in sufficient quantities in all fertilisers used.

It is to be expected that, by careful selection of sets from high producing plants of the best varieties high yielding strains will be evolved with a greater return of the commercial product per acre.

SEEDING OF NUT GRASS.

It has commonly been contended that the Common Nut Grass (*Cyperus rotundus*) does not propagate by seeds, but solely by vegetative means.

It is a common character with plants that propagate freely by vegetative means that viable seed is not produced by them, or at least not produced in abundance; though flowering heads may be freely produced the ovules do not develop into ripe seeds—for example, Buffalo grass, the cultivated bananas, &c.

Nut grass is a widely spread weed over the warmer parts of the world generally. In a recent circular issued by the United States Department of Agriculture it is stated—"Nut grass is popularly supposed to reproduce by means of seed as well as by nuts, but extensive investigation has failed to reveal either seedlings or viable seeds." Other authorities in the United States claim that the weed is spread by seeds as well as by nuts.

Personally, though I have no very definite evidence to offer, I am inclined to think that "Nut grass" is sometimes propagated by seeds and that it is carried from one district to another by stock, manure, &c.

The "seed" has a hard seed-coat that allows it to pass through the digestive tract of animals without its germinating properties being affected.

As there has been so much controversy of late over the matter I hope this year to obtain a number of "seeds," sow them and watch results which will be published later in this Journal.—C. T. WHITE, Government Botanist.

PIG CLUBS FOR SCHOLARS.

SUGGESTED SCHEME FOR QUEENSLAND.

By E. J. SHELTON, Instructor in Pig Raising.

In the United States of America and in Canada, some very practical and profitable Pig Clubs are in operation, and it is suggested that the formation of similar clubs in Queensland should be seriously considered.

In the countries named the boys and girls are engaged in a phase of pig raising which is proving to be of the greatest value to these youthful farmers and to the hog industry of the States. One of the specialists in charge of these clubs, in officially reporting on the subject, remarks that it is safe to say that the industry is being improved and stimulated to a greater degree than ever before by the Boys' and Girls' Pig Clubs which are now to be found in operation in almost every country in Kansas, Iowa, and other hog raising States. There are State Clubs for junior farmers and these are organised by the Division of Extension of the Kansas and State Agricultural Colleges.

Supervision.

In general the work is supervised by the Boys' and Girls' Pig Club Department through a State Club leader, who is employed co-operatively by the United States of America Department of Agriculture and the State Agricultural Colleges. Details of the work are planned and put into operation by an assistant State Leader or specialist in club work, who has direct charge of the live stock club work promoted by the Colleges. Locally the work is carried on by the County Farm Bureau as a definite and important part of its programme of work. In communities where there is to be pig club work, the county agent secures a local leader who helps to enrol the members and organise the club. In counties where the Farm Bureau is not yet organised, other agencies are made use of, such as county superintendents, chambers of commerce, and agricultural instructors. Most of the work, however, is in counties having a farm bureau. The local leader's duty is to encourage the boys and girls and to help in an advisory capacity in feeding, preparing for shows, &c., and in record keeping.

Club Meetings.

The members meet once a month at least to give attention to club business and to discuss their problems, after which a social hour is usually enjoyed. The meetings are thus made most interesting and helpful and are a pleasure and stimulant to the club members. Club tours, picnics, camps, &c., are also part of a well organised club. The club motto is equally applicable to Queensland conditions—viz., "To make the best better." The club pledge likewise—

"I pledge my head to clearer thinking,
My hands to larger service,
My heart to greater loyalty, and
My health to better living for my
club, my community, and my country."

Such is the enthusiastic spirit of loyalty and service that is guiding the efforts of these junior farmers.

Rules of Membership.

Boys and girls from 10 to 20 years of age inclusive are eligible to membership in these clubs, which include sow and litter clubs, young sow clubs, and market pig clubs.

The rules of the sow and litter club provide for club members caring for one or more purebred sows from the time they are bred (mated) until the litters are at least four months old, the desirable young sows to be raised for breeding purposes, the other pigs to be fed for market. The rules for the purebred sow club provide for the selection of a young sow at weaning time, and the raising of this sow for breeding purposes. Many of the club members usually breed their sows and continue in the work a second year as sow and litter club members. The rules of the market pig club provide for the selection of a pig at weaning time, and the feeding and preparation of the pig for market purposes for sale at from five to six months of age.

Benefits Derived by Members.

Thus it can be seen that these three important phases of pig raising are taught to these youthful farmers, and the requirements in feeding and care are those recognised by successful pig breeders as being the most profitable. Records of the kinds and amounts of feed used and the cost of same, together with the time spent on the work, are kept by club members, and these have an important place in the calculation of the results of the year's work.

The Extent of the Work.

During 1923 and 1924 Boys' and Girls' Pig Clubs owned or managed, approximately, 1,800 pigs at a profit to themselves of nearly 30,000 dollars, this in Kansas alone with 107 clubs and an enrolment of 980 members. In addition to general care, the club members are taught to fit their animals for the show ring, with the result that large numbers of club pigs have been shown at local, county, and State fairs and generous prizes won many times in competition with adult breeders. Practically all of the pure breeds of pigs are exhibited, the proud exhibitors are always present, and never tire of showing visitors their pigs and making the pig pens more comfortable and attractive. These boys and girls are emphatic in stating that they are in pig club work to stay, because they have found both interest and profit in the work. Not only are pig clubs financially successful, but they are proving to be a most important agency in directing attention toward improved methods of feeding, &c., in the different communities. Club members conduct many valuable demonstrations which are doing a great deal to stimulate the interest of others. Some of the phases demonstrated include value of balancing the ration; importance of pasture and forage crops of pigs; cost of pork production; use of self-feeders; care of the brood sow and her litter; proper selection and judging of animals; disease prevention and control.

One striking example of what is being done along the lines indicated (and this is especially worthy of note here) is the work the boys and girls have been doing to prevent worm infestation in young pigs. The United States of America Department of Agriculture has worked out one efficient system by which worm infestation can be prevented, but farmers have been slow to put it into practice or to realise its value. For this reason pig club members in about twelve counties in various parts of Kansas have been selected to take up this work as a demonstration. The work is carefully supervised and records are being kept. The results obtained by the boys and girls are to be summarised for each community and county, and made public in order to prove the value of this work, and to secure a more wide-spread adoption of same by farmers in future years. Other demonstrations are conducted in a similar manner.

Stock Judging.

This is another important phase of pig club work and considerable skill in the selection of good stock results from the training which the club members receive along these lines. County stock judging tours and contests are held each year, and the winning teams from each county are sent to the State judging contests held at the State Fairs and Live Stock Shows. The winning teams in these contests have the honour of competing further in Interstate and National judging contests. Thus some expert live stock judges are being trained in pig club work. Another phase or result which should be noted is the improvement which the club animals are making upon the quality of swine in Kansas. Stock which is being introduced and raised by these pig club members is being used as a foundation of what, in the near future, will prove to be the finest purebred herds in the State. Not only is this true but much of the stock raised by these boys and girls is being spread throughout the community in which club members live, so that whole communities are thus receiving the advantage of this work, and the pigs within these areas are being brought to a very much higher plane both in quantity and in quality, and since the State is only a collection of communities a start has been made at the logical place for improvement of the pigs in the State.

Other Benefits.

Mention might also be made of the results which the pig club is credited with by stimulating an increased interest in community, county, and State fairs or shows. This phase of the work is exceedingly important. Boys and girls with their pig clubs are making exhibits at these live stock exhibitions of such a quality that they are attracting the favourable and enthusiastic attention of the entire State, especially in counties where such shows take place. When these splendid animals are placed on exhibit by their owners in club work, they form the centre of attraction and are thus viewed by the adult farmers; the latter return home with a new standard for live stock improvement towards which to work during the following year. Therefore,

pig clubs have done their share in directing towards greatly improved live stock exhibits. The show committees throughout the State have recognised this as one splendid result of the work, and they are providing increased prize money and more classes for the exhibits.

Banking institutions are also showing their faith in the State Pig Club work by loaning the members money with which to buy improved stock. This has become a widespread practice, which is proving advantageous to both the banker and the pig club members. Bankers state that such work is helping to bring prosperity to their communities, and a more favourable attitude towards farming and towards banking. Most of such loans are being made at the rate of 6 per cent. per annum.

One of the most encouraging features of the pig club work is the interest shown by breed societies in the local organisations. Many times these associations have taken the responsibility for organising clubs in their community and counties. In a number of cases breeders, by giving special concessions to the members, have made it possible for the boys and girls to start their club work with purebred animals which they could not have bought had the breeders not made the sacrifice in their favour. Many times also special prizes are donated by these breeders, and this does much to boost the work.

Educational Advantages

In all of the pig club work the educational feature is emphasised so that members may realise that their work in the clubs means more than the winning of prizes; they are given an opportunity to operate in community enterprises and programmes of work, and this is teaching them the true meaning of co-operation. Through pig club work boys and girls are coming to look upon the community and its problems, not only from the mere selfish point of view, but with a spirit that makes for general improvement. This is encouraging a spirit of service and citizenship and is teaching principles to the boys and girls that they can profitably apply in the future.

There would appear to be no reason why we, in Queensland, should not adopt similar methods to those outlined. The variety of forms in which pork may be marketed makes the pig an excellent animal for the purpose, and the project described is one which commends itself for serious consideration.

SCOUR IN YOUNG PIGS.

BOILED RICE AS A REMEDY.

Reference has been made in these pages on several occasions to the disease known as "scour" in young pigs (also called white or yellow scour or diarrhoea), one of the most troublesome of all the scourges to which the young pig is subject; it is likewise one of the most difficult to treat unless treatment is commenced early in the attack.

An American breeder, writing recently on this subject, recommends boiled rice and the water in which the rice has been boiled as a cure for the trouble. This is a very useful remedy; in the case of very young pigs a desertspoonful of warm rice water two or three times a day will suffice; it must be given in teaspoonful doses as a drench and the suckers should be kept away from the sow for at least two hours after dosing. Weaners that still have a good appetite should be given both the boiled rice and the rice water, and no other food should be allowed while this is being given.

Scour in young pigs is due in most cases to overfeeding, or to some abnormal condition of the sow's milk. The ailment can, to an extent, be checked by immediately reducing the sow's ration to an absolute minimum and by compelling her and the suckers to take plenty of exercise in the sunshine; they should also be penned in a clean, dry sty after exercise, and the sty in which they were kept should be thoroughly washed out with hot water, to which some coal-tar disinfectant has been added. It is useless treating the suckers unless attention is given to the sow.

It is advisable to carefully regulate the sow's diet in the treatment of scour; she should be given only sweet, clean nourishing foods of the best quality, and the rations should not be too liberal for the first few days after she farrows. As the suckers grow older they naturally require more food, and her supply should gradually be increased so that she can supply more milk.—E. J. Shelton, H.D.A., Instructor in Pig Raising.

DIARRHOEA OR WHITE SCOUR IN YOUNG PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The following maxims have been compiled as golden rules for the breeder who wishes to ward off attacks of the above dread disease in his pigs.

1. Be careful not to overfeed the sow immediately before or after farrowing or during the first ten days she is rearing her litter.

2. Watch that you do not feed sour decomposed or musty foods, and be careful also to keep musty, mouldy bedding out the sow's sty.

3. Avoid changing the sow's food while she is suckling her litter unless it is found to be absolutely necessary, then effect the change gradually.

4. The moment any of the young pigs show the slightest sign of diarrhoea (scouring) reduce the sow's food supply by half and compel her to take liberal exercise, the object being to reduce the quantity of milk she is producing. Some breeders believe that the sow should have one heaped teaspoonful of copperas (sulphate of iron) dissolved in hot water and placed in her feed; this will do no harm and certainly would tend to reduce the supply of milk and tone up her system.

It is well to note that when the sow farrows she has an ample supply of milk (or she should have if she is in normal condition) for her progeny, and they soon reduce her normal supply; but some breeders in their enthusiasm and with a desire to give her a good time both before and after farrowing immediately increase her food supply and keep her trough well filled. Under this treatment the sow likewise becomes enthusiastic (it might be said) and produces heavier supplies of milk, consequently, the little fellows get more than is good for them or is necessary, and as their digestive organs cannot effectively deal with the extra supply, the result is that indigestion is set up and this is generally accompanied by inflammation of the stomach and intestines. The pigs then sicken and a feverish condition follows, the bowels refuse to act properly and grey-coloured, evil smelling, profuse diarrhoea follows. The young pigs do not immediately lose their appetites but their condition gradually grows worse, and they begin to die off. The owner frequently thinks they are dying of starvation and continues to force the sow with food so that she will produce more milk. The sow thus becomes overburdened with milk, and as the suckers gradually drop away from her she cannot get rid of it, inflammation of her udders follows and she also sickens and will probably suffer to such an extent as to lose her supply of milk altogether. This is commonly referred to as milk fever.

It is necessary to remember that the stomach of the young pig is very small and they require small quantities of food only and at frequent intervals. They are, however, easily overdone and treating them is a different matter. To prevent trouble note that the sow should not be fed during the day she farrows, give her a thin gruel only, about eight or ten hours after farrowing, and very gradually increase her food supply after the suckers are born and until they are a week or ten days old. She must have sweet succulent green food, and ample exercise, and when the little fellows are ten days old they may be allowed to explore their surroundings, and gradually become accustomed to following the sow about. If, after all, due care is taken to prevent the appearance of white scour in successive litters, it should occur and not yield readily to treatment, it would be better to seek veterinary aid, for the trouble may be due to infection.

To summarise: Immediately there is any sign of scouring in one or more of the young pigs, reduce the sow's food supply by half; compel her and the suckers to take exercise; give copperas in the food as advised; move the sow and suckers to a clean, dry pen, and feed the sow very lightly for a few days. If the ailment persists, give the sow a second dose of medicine (the copperas should be dissolved in hot water before being added to the food); give the suckers teaspoonful doses of castor oil each on the first day, and again next day if still scouring; sprinkle the floors and yards lightly with air slacked lime and keep them scrupulously clean; add a cupful of lime-water to the sow's food every day, and be careful not only to use sweet clean food, but also to place it in a clean food trough in a clean pen. Later, when the young pigs begin to feed "on their own," give them some lime-water, too; it never does them any harm so long as it is not used too freely. The lime-water is readily prepared by taking a tub or barrel, cleaning it out thoroughly, and soaking in clean water for a day or two. Then half-fill with clean rain water, and put about half a bucketful of air-slacked lime in the barrel, and after stirring water and lime together, allow to settle for several hours. It will be noticed that a thin "scum" floats on the surface, and that the water is as clear as crystal. As long as this scum forms daily, the lime-water is good; and the barrel can be refilled after use. Stir the lime up occasionally, and it will be good for two or three weeks at

least. When the scum fails to appear on the surface, clean the barrel out, and start again with a fresh supply of lime and water. Never use an iron or tin container for this purpose.

Cleanliness is next to godliness in all matters relating to pig management. Common sense methods of feeding and care are also golden rules, and a knowledge of the cause and effects of the common diseases to which stock are subject will be of the greatest value at all times.

HOUSING THE PIG.

By E. J. SHELTON, Instructor in Pig Raising.

The climatic conditions in Queensland in general are such that there is no occasion for the pig farmer to have to incur heavy expenditure in the erection of expensive accommodation houses for his breeding stock or fattening pigs. This does not, however, suggest that accommodation is unnecessary or that the tumbled-down unsanitary so-called pig sties one sees on so many farms are good enough.

It is the objective of this series of articles on "Housing the Pig" to supply information that can be applied by pig breeders in the "lay out" of their pig sties, paddocks, &c.; to supply plans of simple structures, and where possible to illustrate the different types of houses suggested as being suitable for erection on different types of farms.

It will readily be understood that the farmer engaged in fattening pigs on the surplus butter-milk, whey, or skim milk from butter or cheese factories and who has at certain seasons of the year an abnormal supply of this product to handle, must of necessity have more extensive feeding and housing arrangements than, say, the dairy farmer who keeps pigs as a side line or purely as an adjunct to dairying. The suburban pig farmer who utilises the waste food from hotels, cafés, sweepings from flour mills, produce stores, &c., waste vegetables and fruit from the markets, and possibly some meat products, must also in order to conform to municipal or shire regulations and to provide for the requirements of a large number of fattening pigs, have ample and convenient accommodation. The suburban farmer is usually somewhat cramped for space, hence he cannot give his breeding stock the benefit of a pig paddock, one or more acres in extent. He also has to provide a plant for cooking most of his food, and must have a more liberal water supply than would be necessary further afield.

The butcher who runs pigs in conjunction with his boiling down establishment is now having regular visits from the slaughtering inspector, who, under the powers vested in him by the Slaughtering Act or by other authority, demands that the pig sty accommodation be brought up to the standard required by these Acts, which includes the provision of concrete feeding floors, &c., as will be referred to later on in this series of articles.

The man who specialises in stud pigs and whose main source of income is to be derived from the sale of selected boars and sows, will find that he requires a good deal more accommodation, small yards, shelter sheds, &c., than the farmer raising pigs for direct sale to butchers or bacon factories.

The bacon factory itself must provide up-to-date accommodation, even though it only "rests" the bacon pigs prior to slaughter, and provides them principally with cool water to drink, but who make no special provision for feeding pigs.

The farmer who intends raising pigs on the paddock system and whose pigs will live the "open-air" life with all its advantages in our genial climate, will require a special type of accommodation to which extensive reference will be made as we proceed with our study. His principal expenditure will be in the purchase of wire-netting, barbed wire, fencing posts and rails, straining posts, portable shelter sheds, water and food troughs in addition to special accommodation for farrowing sows, &c.

Thus it will be seen that the subject opens up a wide field for study, and one that it is hoped will shortly provide ample material for a complete treatise on housing and accommodation of pigs. The illustrations, Figs. 1 and 2, are of open-fronted shelter sheds as originally designed at the Hawkesbury Agricultural College, Richmond, New South Wales, during the writer's term there as Pig and Bacon Expert. They were designed in collaboration with the then Principal (Mr. H. W. Potts), in whose text-book "Potts on Pigs" these illustrations appear. The plan was prepared by Mr. Adam Brooks, works overseer in the N.S.W. Agricultural Department. These shelter sheds are simple yet convenient and roomy and could be constructed of sawn hardwood palings, or other building material, with corrugated iron roof or other suitable material. The illustration and plan give complete details as to the layout of the building, its length, breadth, height, &c. Fig. 2 shows several Berkshire sows "in occupancy."

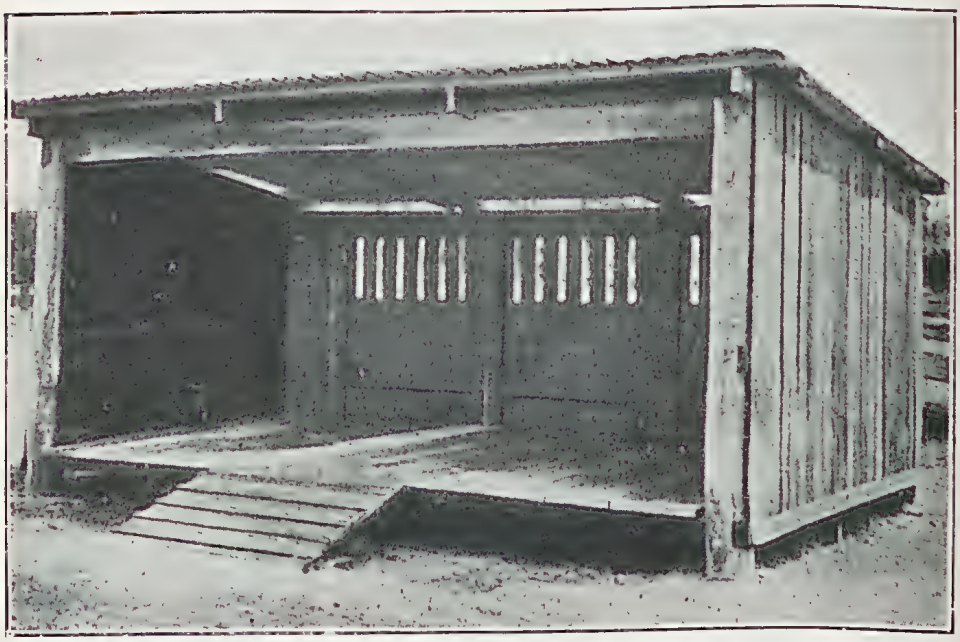


FIG. 1.—OPEN-FRONTED SHELTER SHED (See also Fig. 2).
This type of accommodation adds value to the farm, and is not only convenient, but attractive and useful, yet inexpensive.

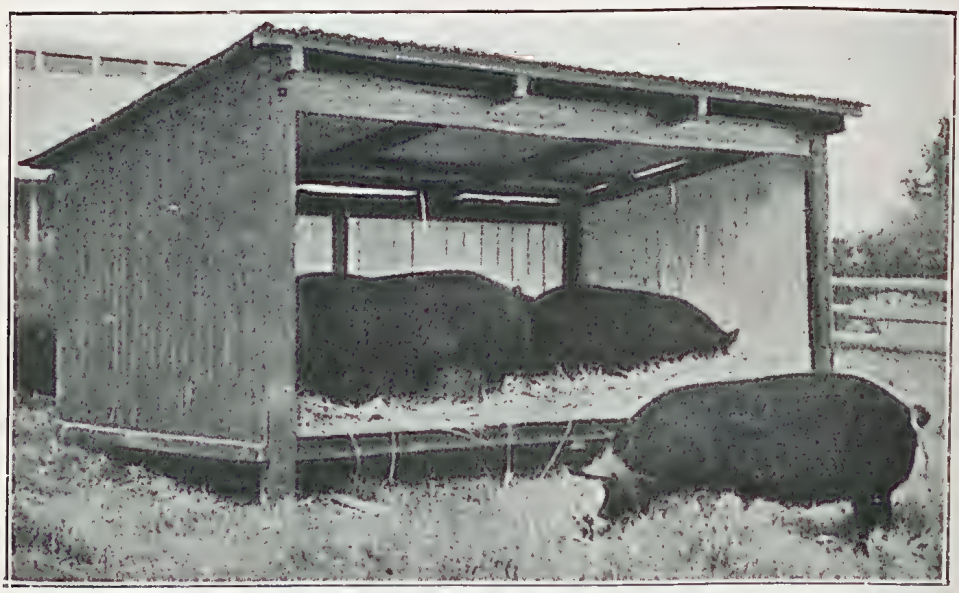


FIG. 2.—OPEN-FRONTED SHELTER SHED AT HAWKEBBURY AGRICULTURAL COLLEGE, N.S.W.
Berkshire Sows enjoying the advantages of a simple yet convenient Shelter Shed such as is recommended for Queensland Farms.

Fig. 3.—Housing the Pig.
Berkshire Sows at the Farm Home for Boys, Westbrook *viâ* Toowoomba. These sows appreciate the shade and protection provided by the Budelia Shrub, a most useful addition to the shade around the Piggery.

Fig. 4.
Showing the lay-out and arrangement of Paddocks, Shelter-sheds, &c., on a noted English Stud Farm.

Fig. 3 shows the advantages of ornamental trees in providing ample shade for the pigs. The illustration is of some of the matrons in the Berkshire stud at the Westbrook Farm House for Boys, where Mr. Thos. Jones, as superintendent, has established a high-class stud of the famous old English Berkshire. The shade is provided in this instance by a flowering shrub, commonly known as Budelia.

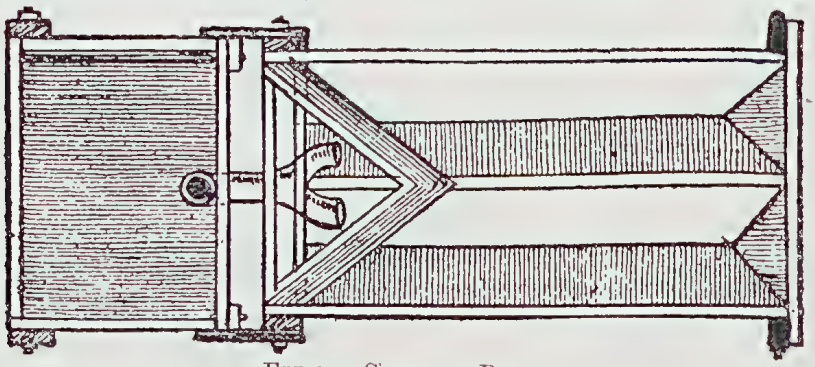
Fig. 4—where Berkshires thrive—shows the farrowing pens at Swinton Grange, England, where Major Clive Behrens is breeding Berkshires on a large scale on the modern "open-pair" paddock system.

(TO BE CONTINUED.)

PLATE 66.—DOWN ON THE FARM.
The piglet appreciates its bottle. A domestic scene on Mr. R. Wight's farm at Mutdapilly

FEEDING SLOP TO PIGS.

Pouring wet hog feed all over one's shoes in trying to satisfy a lot of crowding, squealing pigs need not be a part of every day's work. A trough that will give the animals their swill without the usual mess, and that will save a great deal of feed and temper is shown in the illustration. It can be made from an old trough plus a piece of rainspout and an old barrel or box. If the trough is made double, as shown, there will be much less crowding, and the feed will be distributed more evenly. A



FEEDING SLOPS TO PIGS.

piece of rain-spout with a Y at one end lets the swill down to the trough from the barrel or box in which it has been mixed. Each opening of the tube opens into one of the troughs and the openings are protected with a V-shaped guard made of boards. After the swill has been well mixed the plug is drawn from the bottom of the box, and the swill runs into each of the troughs, which can be made any length.—"Country Gentleman."

QUEENSLAND SHOW DATES FOR 1925.

March 31, April 1—Goondiwindi.
1–2—Dalby P. and A. Association (C. Harvey, Secretary).
11—South Brisbane A., H. and I. Association.
13–14—Herberton M., A. and P. Association (E. C. Wright, Secretary).
15—Pittsworth P., A. and H. Association (B. Binney, Secretary).
16–17—Wondai A., P. and I. Society (G. D. Griffith, Secretary).
18—South Brisbane.
21—Milmerran District A., P., H. and I. Association (J. H. Sopp, Secretary).
21—Milmerran.
21–22—Chinchilla A. and P. Association (J. E. Mackie, Secretary).
22–23—Killarney Agricultural Society (Clifford Alford, Secretary).
28–30—Barcoo Pastoral Society, Blackall (W. P. Tilden, Secretary).
28–30—Toowoomba Royal Agricultural Society of Queensland (G. Noble, Secretary).
May 30, 1—Kingaroy A., P. and I. Society (J S. Michen, Secretary).
5–6—Taroom A. and P. Association (T. O'Malley, Secretary).
6–7—Central Warrego P. and A. Association, Charleville (W. R. Sinnott, Secretary).
6–7—Longreach.
6–7—Maleny A., I., P., and R. Society (G. B. Sutton, Secretary).
6–7—Toogoolawah D., A., and I. Association (Douglas Young, Secretary).
7–8—Nanango.
13–14—Springsure.
13–14—Maranoa P., A., and I. Association, Mitchell (W. J. Rogencamp, Secretary).
13–14—Fassifern A. and P. Association, Boonah (G. E. Ball, Secretary).
13–14—Murgon P., A., and H. Society (N. Waldock, Secretary).
20–21—Emerald.
20–21—Western P. and A. Association, Roma (F. W. Mills, Secretary).
20–22—Queensland P. and A. Society, Ipswich (H. W. Watson, Secretary).
26–27—Wallumbilla A. and P. Association (M. J. Grace, Secretary).
27–28—Esk P., A., and I. Association (T. C. Pryde, Secretary).
June 2–3—Marburg and District A. and I. Association (G. E. Dance, Secretary).
2–3—Hughenden.
2–4—Maryborough.
3—Brookfield, Pullen Vale, and Moggill Farmers' Association (John Phillips, Secretary).
3–4—Logan and Albert A. and P. Society, Beaudesert (P. F. Dever, Secretary).
3–4—Proserpine.
6—Buderim Mountain A. and I. Society (S. Anderson, Secretary).
6–9—Isis District P., A., and I. Society (G. W. Wrench, Secretary).
11–13—Bundaberg.
15–17—Gin Gin.
17–18—Woombye.
18–19—Gladstone.
19–20—Lowood and Tarampa P. and A. Association (S. Coleman, Secretary).
23–27—Rockhampton Agricultural Society (H. Hill, Secretary).
July 30, 1–2—Mackay.
1–2—Lockyer A. and I. Society, Gatton (Percy Skinner, Secretary).
2–3—Biggenden A. and P. Society (C. J. Stephensen, Secretary).
2–3—Kilcoy.
3–4—Sandgate A., H. and I. Association (W. F. Kenny, Secretary).
7–9—Townsville.
8–9—Laidley.
9–10—Woodford.
11—Wellington Point.

July 15–16—Charters Towers.
16–17—Caboolture.
22–23—Ingham.
24–25—Ayr.
24–25—Rosewood A. and H. Association (R. J. Walsh, Secretary).
24–25—Ithaca A. and I. Association (T. A. Bennion, Secretary).
29–30—Bowen.
31, Aug 1—Pine Rivers.
Aug 1—Mount Gravatt.
5–6—Humpybong A., H. and I. Society, Redcliffe (C. G. Graves, Secretary).
10–15—Royal National A. and I. Association of Queensland, Brisbane (J. Bain, Secretary).
26–27—Crow's Nest A., H. and I. Society (J. Pike, Secretary).
Sept. 2–3 Esk Bushmen's Carnival.
4–5—Wynnum.
12—Zillmere.
24–25—A. and P. Society of Southern Queensland, Beenleigh (W. Laughlin Secretary).
26—Rocklea A. and I. Society (C. R. Gwynne, Secretary).
26—Maroochydore Agricultural Society.
Oct. 1—Kenilworth P., A., H. and I. Society (R. Houston, Secretary).
2–3—Toombul A., H. and I. Association (A. J. Thompson, Secretary).
9—Southport A., H. and I. Society (S. H. Earl, Secretary).
10—Enoggera A., H. and I. Association (N. Thomson, Secretary).
16—Nerang.

CONTROL OF COTTON INDUSTRY.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) received a recent deputation representative of the Cotton Advisory Board and attended by Messrs. H. H. Bentley (Secretary to the Council of Agriculture), G. McDonald, and J. W. Camplin in respect to the question of State decontrol of the ginning and the marketing of cotton, conditional on the Commonwealth Government's favourable consideration of a request for a bounty for an extended period of years.

The deputation pointed out that in making that request it was not unmindful of what the Queensland Government had done in the direction of establishing the cotton industry in this State by guaranteeing the price of 5½d. per lb. for a period of five years. It was, however, of the opinion that the State Government should not be saddled with the nurturing of an industry which was going to be beneficial to the whole of Australia. Recently the Council of Agriculture had completed an agreement with the British Australian Cotton Growing Association having for its object the securing of the option offered to the growers by the Association for the purchase of its physical assets in Queensland as a going concern at any period prior to 1st May, 1928. The question of a bounty from the Federal Government was also contingent upon the following proposals, viz.:—

(1) The present Government policy under the Cotton Industry Act to stand for the current season;

(2) The Act to be repealed before the next cotton season;

(3) A Cotton Pool under the Pools Act to be constituted without State Government guarantee and without State Government control of ginning and marketing;

(4) The B.A.C.A. Agreement with the Government to cease after the end of the present season and instead a fresh agreement to be made with the Pool;

(5) The B.A.C.A. and the growers' representatives to immediately take up the matter of guarantee for the next season with the Commonwealth Government.

The Minister, in reply to the deputation, intimated that before considering the proposals involving a change in the Government's policy in regard to the cotton industry he would have to be satisfied that the cotton-growers favoured the scheme. To that end he suggested that the questions at issue should be fully explained to the growers, and that a vote should be taken of the producers concerned through the Local Producers' Associations. If he were satisfied that a substantial majority of the growers favoured the scheme for State decontrol and the substitution of a Commonwealth bounty, he would be prepared to place the matter before Cabinet. The matter of a bounty was one entirely for the Commonwealth Government.

General Notes.

Bird Sanctuary at Yeerongpilly.

In accordance with the provisions of the Animals and Birds Acts, the Yeerongpilly Golf Links have been declared a sanctuary in which it is unlawful for any person to shoot or kill any animal or bird.

Definition of Primary Producer.

At the request of the Council of Agriculture it has been approved that the term "primary producer" mentioned in the Primary Producers' Organisation Acts, shall include apiarists and farmers' sons, 18 years of age and upwards, working on their fathers' farms, not for wages but for their keep only.

Pure Seeds.

The Premier (Hon. W. N. Gillies) stated recently that, as the success or failure of a crop may be wholly determined by the condition of the seed sown, it is of the utmost importance, particularly after a wet harvest such as that recently experienced, that every farmer should know the purity and germination of the cereals that he intends to sow.

It is desired that, as far as possible, all farmers should know that arrangements have now been made by which samples of barley, oats, rye, and wheat will be examined at the Seed Laboratory, Brisbane, free of charge.

Leaflets giving full particulars of the testing of samples of seed, also forms for enclosure with samples, may be obtained from the Department of Agriculture and Stock, Brisbane, or from officers of the department in the various country districts.

Primary Products Pools Act—Additional Regulations.

An addition has been made to the Primary Products Pools Act Regulations, which addition provides that, where the name of a candidate not duly nominated for membership on any Pool Board appears on a ballot-paper, the figure placed against his name shall be disregarded for the purpose of determining the order of preference.

Regulation 11 of the Primary Products Pool Act has been altered to read that the nomination of every candidate for election as a member of any Board shall be signed by at least three persons (or such greater number of persons as may be decided by the Minister) instead of eleven, as was the case previously. Of course, the persons to sign the nomination must be growers of the commodity for which the Board is being constituted.

Pineapple Production.

A writer in the "Demerara Chronicle" discusses pineapple production in the Antilles, Hawaii, Haiti, and South Africa in a recent issue of that journal. Reviewing lessons of the past, he says, that without looking on the black side, we may usefully consider the causes of two instances of failure in regard to pineapple production in order to obtain information likely to be of value in making a programme of development in any new country. The first instance is that of Florida. Although that State has revived its pineapple industry, the industry suffered almost complete extinction a few years ago. The causes of failure appear to have been two: exhaustion of soil humus, and the disease known as wilt or red wilt, associated with a parasite known as the root nematode or worm. It would appear that soil depletion weakened pineapples in Florida to such an extent that they became unable to resist the nematode which appears to be widely distributed. The important point is that, given proper cultivation and adequate manuring, varieties of pineapple can be successfully grown in spite of the nematode; and further, areas which are badly infested by this worm can be freed by growing for two or three years crops like Natal grass and certain varieties of cow peas, on the roots of which the nematodes are unable to live.

Peanut Board.

Notice of intention to create a new Peanut Board has been issued. All peanuts harvested from areas of one-half acre and upwards during the period 1st July, 1924, to 30th June, 1927, will come under the supervision of the proposed Board which will consist of four members, one to represent the Council of Agriculture and three to represent the growers.

The Board to deal with the crop until the 31st August, 1925, will consist of the members appointed to deal with last season's crop, viz.:—

C. F. Adermann (Chairman),
W. Muir,
R. M. Wise, and
W. O'Mara (Representative of Council of Agriculture).

The members appointed after the 31st August, 1925, will hold office for one year from the date of their appointments. Persons eligible to vote will be persons who have had growing peanuts on areas of one-half acre and upwards at any time during a period of twelve months prior to any referendum or election held between the first day of July, 1924, and the thirtieth day of January, 1925.

Any petition for a poll to decide whether the Board shall be created must be signed by at least fifty growers as above, and must reach the Minister for Agriculture and Stock before the 28th March, 1925. To ensure their names being on the roll of persons eligible to vote, growers as beforementioned are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Hamilton Cold Stores.

The Minister for Agriculture (Hon. W. Forgan Smith), in the course of a recent Press interview, stated that his attention had been drawn to a statement which had appeared in the Metropolitan Press relative to the position in connection with cold storage accommodation for butter in Brisbane.

It was stated that all cold storage space in the metropolitan area was packed up with butter awaiting shipment; and an attempt was made to cast the blame upon the State Government.

At the outset the Minister stated that it had been claimed that the exportation of all commodities from Australia was a matter that come under the control of the Commonwealth Government, however the State Government had made an endeavour to assist in the development of primary industry by having under course of construction a cold storage premises at the Hamilton.

This store, when completed, will supersede the existing State Government Cold Stores at Roma Street, which have been conducted for many years past under the control of the Railway Commissioner. The Cold Stores at Roma Street have served a very useful purpose in the development of the dairying industry in Queensland.

The production of butter and cheese has developed to such an extent that the Cold Stores at Roma Street are incapable of providing sufficient cold storage space for the quantity of butter and cheese now manufactured.

There are also cold storage premises outside those owned by the State Government, which are conducted by private enterprise, and in the past these firms canvassed for the business of cold storage of dairy products. They are still in the field, but, contrary to statements which have appeared in the Press, chronicling the disaster to primary industries that has been occasioned by the unsympathetic administration of the affairs of the man on the land by the Labour Government, we find that the cold storage space now available is insufficient to cope with the volume of dairy produce that is coming forward for exportation overseas.

The congestion in cold storage accommodation has been rendered somewhat more acute by the fact that the sailing dates of one or more vessels, which were expected to carry butter, have been deferred.

To relieve the position the Minister arranged to accept, temporarily, butter at the Hamilton Cold Stores.

The production of butter and cheese is at present almost at a standstill, and the complement of dairy produce coming forward for export is slightly less than it was some little time ago.

One firm that had undertaken to cold store 1,000 boxes of butter per day found that they were unable to do so when the butter was actually submitted to them for storage, and naturally this butter is now included amongst the supplies for which accommodation is being sought at the Hamilton.

Atherton Tableland Maize Board.

The following nominations have been received by the Department of Agriculture and Stock to fill the vacancies on the Atherton Tableland Maize Board, caused by the retirement of Messrs. McDonald and Armstrong, owing to the expiration of their term of office on the 31st March next:—

H. J. Armstrong, junr., Atherton.

D. H. Wallace, Atherton.

J. J. McDonald, Tolga.

Drummond Macpherson, Tolga.

John Gargan, Kairi.

George Ferguson, Kulara.

The ballot-papers are returnable to the Department not later than the 31st March, 1925.

Fodder Conservation.

Following on the Conference that was held on the 21st January last, between the Minister for Agriculture and representatives of the various Associated Banks, on the subject of Fodder Conservation, the Premier (Hon. W. N. Gillies) stated recently that at the conclusion of that Conference, the representatives of the banks present, promised that the matter would be considered by their Association at its next meeting.

Mr. Gillies has received a letter from the Secretary of the Associated Banks to the effect that while the matter has been placed on the agenda paper, no meeting of the Association has been held since the Conference. A further letter has been received by Mr. Gillies from the Chairman of the Associated Banks, which advises that the question of extending help to farmers for fodder conservation had been fully discussed by the Association. The Chairman added that while his members are unanimously of opinion that each application for financial assistance for the purpose of fodder conservation must be dealt with on its individual merits, he was requested to advise that the trading banks are very sympathetic to the movement and thoroughly believe in its value to the community.

Milk and Cream Testing Examination.

Patullo, John David, H.T., State School, Welleamp; Stenzil, Geo. Edward, "Taronga," Beatrice street, Ascot; Carter, Oswald Stanley, Wowan, *viâ* Rockhampton; Stubbin, Vincent Ernest, State School, Middle Creek, Brooklands, *viâ* Nanango; Biggs, Aubrey Wilfred, Cressbrook, Toogoolawah; Anderson, John Joseph Edward, Atherton Butter Factory, Malanda; Davidson, John Roy, Toogoolawah Condensery; Rattray, Frances Mary, Injune, *viâ* Roma; Cunningham, Bruce, H.T., State School, Haden; Hutton, James B., Kingsthorpe; Daly, James Conleth, Cooby Creek Cheese Factory, Meringandan; Morgan, James Llewellyn, Goombungee; Ogilvie, Lloyd Welesley, Butter Factory, Allora; Coppin, Wm. Jas. Jeffery, care of M. J. Dobson, Ross road, Malanda; Kemp, James, Butter Factory, Kingaroy; Little, Alfred Frederick, Biddeston Cheese Factory, *viâ* Oakey; James, Norman, Post Office, Colinton; Batzloff, Wm. John, Biddeston Cheese Factory, *viâ* Oakey; Rodgers, Albert Edward, Box 5, Murgon; Marks, Wm. Victor, Atherton Butter Factory, Malanda; Mullins, Chas. Thomas, Pittsworth; Gleeson, Edwin Ambrose, Crow's Nest; Judd, Walter James, Crow's Nest; Growcock, James, Wide Bay Dairy Company, Gympie; McRobert, Chas. Wm., Mundubbera; Boland, Raymond Patrick, Lewis street, Roma; Brown, N. V., Ashford's Hill, Gympie; Hamilton, R., Cheese Factory, Southbrook; Fox, Wm. Joseph, Hodgson Vale Cheese Factory, *viâ* Toowoomba; Mulqueeney, Herbert John, Sunnyvale, *viâ* Bell; Leary, James Ambrose, care of Butter Factory, Booval; McPhee, Henry Norman R., Sunnyvale, *viâ* Bell; Barnes, John Francis, Melbourne Hotel, Bundaberg; French, Wm. David, Sunnyvale, *viâ* Bell; Mann, Victor Crouch, Yarranlea; Souwer, Hermanus Johannes, Mundubbera; Chamberlin, V., Kingsthorpe; Littlemore, John Alfred, Gladstone; McGrath, P., Cedar Pocket, Gympie; Colthorpe, Henry James, Gladstone; Bennett, N. C., Cooroy; Hedley, John Rutter, Cothill road, Booval; McPhee, Angus Alexander, Sunnyvale, *viâ* Bell; Ford, John Wm., Butter Factory, Clifton; Redman, Lionel, Butter Factory, Allora; Wyllie, Geo. Garvin, G.P.O., Bundaberg; Conroy, Kevin John, Bundaberg Dairy Company; Walker, John L. W., Wide Bay Dairy Company, Gympie; Gamble, James E., Southbrook Co-operative Dairy Company; Lambley, Chas. Joseph, Victoria Hill, *viâ* Clifton.

The Pest Destroyers Act of 1923.

Buyers of Insecticides, Fungicides, Vermin Destroyers, Weed Killers, &c., would do well to note that every dealer must, before delivery to the buyer, affix to or upon every package a label conforming in all respects with the specimen label forwarded to the Department of Agriculture. The label must state—

1. The distinctive name of the pest destroyer.

2. The net weight contained in the package or, in the case of liquids, the true volume content expressed in Imperial gallons or fractional parts thereof.

3. The names of the active constituents, and when so required by the prescribed standards, the percentage of such active constituents and (or) the impurities contained therein.

4. All directions for use of the pest destroyer.

5. The name and address of the Queensland wholesale dealer.

On the purchase of any pest destroyer of a greater value than five shillings, the buyer should, on or before delivery of such pest destroyer, receive from the dealer an invoice setting forth:—

1. The name and address of the dealer.

2. The net weight or Imperial measure and name of the pest destroyer.

3. A warranty in the following words:—Notwithstanding any agreement to the contrary, this invoice shall be deemed to be and shall have effect as a warranty by me, the seller, that the constituents of the pest destroyer sold, and the percentage in which each constituent is contained therein and the percentage of each constituent contained in that part thereof which is soluble in cold water, accurately corresponds with the constituents and percentages respectively stated in the statutory declaration furnished to the Under Secretary, Department of Agriculture and Stock, Brisbane, as prescribed with respect to the pest destroyer of the same name by "*The Pest Destroyers Act of* 1923."

The Act provides that no purchaser is bound to accept delivery of any pest destroyer unless it is labelled and invoiced in accordance with the above; further, the buyer is not bound to take delivery of any package of pest destroyer which upon weighing does not correspond with the weight as set out on the label and invoice.

Central District Prospects.

The Director of Agriculture (Mr. H. C. Quodling), on his return recently from the Central District, stated the country generally is looking exceptionally well. January rains appeared to have been well up to the average, excepting on a section of country immediately to the north and west of Rockhampton, where the registration for the month was under 2 inches, as against several inches elsewhere.

Touching the question of Departmental activities, Mr. Quodling stated that the Experiment and Crop Demonstration work carried out for several years past on individual farms under the supervision of the Central District Agricultural Instructor, Mr. G. B. Brooks, was showing encouraging results. Much had been done to improve existing varieties of sweet potatoes. New kinds had been introduced from other States and countries; varieties had been raised by cross-fertilisation, and subsequently brought into cultivation; and existing types were now classified under a scientifically designed nomenclature.

The demand for cuttings from tested strain had been maintained with the result that growers will soon have larger supplies available for culinary purposes and for stock feeding.

The practice of carrying out trials with winter and summer growing fodder crops on individual farms is creating interest among dairymen, who invariably find it imperative at times to provide food for milch cows. Obviously, the system of providing for a continuity of fodder to make up for the lack of succulence in pastures during the winter and spring seasons calls for more universal adoption. Success has also attended efforts to conserve surplus supplies of fodder as ensilage. The present season's arrangements in respect to stack ensilage embrace demonstrations in several localities, extending from Rosedale to Marlborough, and inclusive also of the Dawson Valley.

In the Boyne Valley last year winter fodder trials furnished good returns, and clearly showed that a continuity of green fodders combined with legumes was readily obtainable, thereby ensuring practically a farm-grown balanced ration for dairy cows during a period of the year when natural grasses were innutritious.

Several crops found suitable for pig feeding purposes have also shown the value of systematised production of home-grown supplies. Experiments conducted with English potatoes and onions on individual farms indicated that both offered a good medium of profit to producers who have suitable soils available for raising food crops, for which an everyday demand exists.

Several varieties of grain sorghums are under test in different localities. An effort is being made to popularise this class of grain which has shown itself to be more dependable in dry seasons than maize, and capable also of being used on farms as a substitute for this latter crop for stock and poultry feeding purposes.

In the near future, production in the Central District must soon show a pronounced increase. In the Callide Valley alone there are some hundreds of new settlers hard at work in the development of their selections. In this locality some excellent agricultural land exists. Now that the settlers are commencing to establish themselves, it is the intention of the Department to extend its system of crop demonstration to the district.

Butter Board.

Following on the favourable result of the recent referendum held in connection with the proposed Butter Board, the Board has now been constituted to deal with butter produced at factories for a period of three years as from the 21st February, 1925. The Board will consist of five representatives of growers and one to represent the Council of Agriculture. Representatives of growers will be elected by butter factories at present operating in the State, and nominations are now being called for election for one year. The factories have been divided into five divisions, and each division will elect one representative.

The Board will be empowered to make levies on companies as are necessary to meet the payment of allowances and expenses to members of the Board as the Minister for Agriculture may think fit. No company shall deliver butter to the Board before the date to be published by the Minister in the "Government Gazette." Until such date, on Saturday in each week, every company shall deliver to the Board, in respect of each of its factories, a return showing the quantity of butter manufactured during the past preceding seven days, and the names and addresses of the persons to whom such butter was delivered or consigned. Agents for the sale of butter will furnish similar returns. The Board will also be empowered to make monetary arrangements necessary to effect equalisation of returns to companies. The Minister may appoint any person or persons to inspect and take copies of books, papers, vouchers, &c., of any company or agent, for the purpose of ascertaining or verifying any particulars mentioned in returns of companies.

Persons eligible to vote on any referendum or election in connection with the said Board shall be companies manufacturing butter in the State of Queensland.

Staff Changes and Appointments.

As a result of Friday Island, in the Torres Straits, being recently declared a sanctuary for animals and birds, Mr. S. Wilson, Police Magistrate, Thursday Island, and Mr. H. N. Hockings, also of Thursday Island, have been appointed officers under and for the purposes of the Animals and Birds Act.

Mr. F. G. Holdaway, formerly Assistant to Entomologists, has been appointed Assistant Entomologist, Cotton Section, Department of Agriculture and Stock.

An Order in Council has been approved removing all members of Local Sugar Cane Prices Boards appointed during 1924, excepting the members of the Babinda, Bingera, Farleigh, Invicta, Macknade, Maryborough, Moreton, Mount Bauple, Mourilyan, Plane Creek, and South Johnstone, which latter members had their term of office extended to the 28th February.

Mr. Geo. Boyle has been appointed a member of the Cotton Advisory Board constituted last week. Mr. Boyle will take the place on the Board of Mr. J. McRobert.

As Mr. J. T. Jenkins, who held the position of Acting Inspector of Slaughterhouses at Winton has left Queensland, his appointment as above has been cancelled.

Constable J. Goodfellow, of Roma, has been appointed an Acting Inspector of Stock.

Messrs. M. Custance, W. Dixon, and E. T. Lewin, all of Brisbane, and Mr. D. Culhane, of Cambooya, have been appointed Inspectors of Stock; Mr. J. A. O'Neill, of Glastonbury, *viâ* Gympie, has been appointed an Inspector of Dairies.

The appointment of Mr. S. L. Brimblecombe as Honorary Inspector under the Diseases in Plants Acts has been cancelled.

The Officer in Charge of Police at Chinchilla has been appointed an Acting Inspector of Stock, and Constable J. M. McKeever, of Dayboro, has been appointed an Inspector of Slaughterhouses.

The term of office of the members of the Council of Agriculture has been extended to the 31st December, 1925.

The resignation of Mr. A. R. Atherton of Mackay as an Officer under and for the purpose of the Animals and Birds Acts has been accepted.

Mr. J. M. McLaren, of Cunnamulla, has been appointed Government Representative on the Paroo Dingo Board.

Constables J. P. Phelan and P. Shepherd, of Eulo and Yaamba, respectively, have been appointed Inspectors of Slaughterhouses.

The appointments of Mr. A. H. T. Bedford, Warwick, as Inspector, Advances to Settlers Branch, State Advances Corporation, and as Inspector, Agricultural Bank, have been confirmed.

Mr. W. Bennett, of Talwood Station, Talwood, has been appointed an Acting Inspector of Stock.

Mr. A. B. Smyrell, District Inspector of Stock and Brands, and Mr. P. J. Short, Inspector of Stock and Slaughterhouses, have been retired from the Public Service as from the 30th June, 1925.

For the purposes of the Primary Producers' Organisation Act, a Cotton Advisory Board has been formed to consist of the following members:—L. R. Macgregor, G. E. McDonald, R. J. Webster, J. McRobert, R. L. Boyd, A. H. Carrington, G. W. McLean, J. W. Camplin, D. C. Pryce, J. Scanlan, and E. V. Little.

Constable E. W. Conway, of Tangorin, has been appointed an Inspector of Slaughterhouses.

Mr. J. Cavill, of Southport, has been appointed an Officer under and for the purposes of the Animals and Birds Act.

The following gentlemen, members of the committee of the Brisbane Golf Club, have been appointed officers under and for the purposes of the Animals and Birds Acts:—

E. H. Macartney, J. H. Cannan, W. B. Savage, T. B. Hunter, H. J. Craig, S. T. Little, D. A. McNab, A. D. Pearce, E. H. Waring, and R. A. Wearne.

Mr. J. McDonald, caretaker of the Yeerongpilly Links, has also been appointed an officer as above.

Mr. C. R. Toop, B.V.Sc., of Maitland, S.A., has been appointed a part-time Veterinary Officer for the Northern District. Mr. Toop's headquarters will be at Atherton.

Mr. S. C. O. Jessop, of the Land Office, Mitchell, has been appointed an Inspector of Stock.

The resignation of Mr. T. T. Southerden, of Stanthorpe, as a Temporary Inspector under the Diseases in Plants Act has been accepted.

Bald Hills Sanctuary.

The Bald Hills district has been declared a sanctuary for the protection of native animals and birds.

Fruit Fly Precautions at Stanthorpe.

Last year a Regulation was issued under the Diseases in Plants Act restricting the importation of certain fruits into the Stanthorpe district. This Regulation provides that no person shall introduce any of the following fruits from any district within which the Queensland Fruit Fly, the Spotted Fruit Fly, or the Mediterranean Fruit Fly existed into Stanthorpe and district unless such fruit had been in cold storage for a period of not less than twenty-one days at a temperature of not more than 35 degrees Fahr.:—

Apples, apricots, barberry, Brazilian cherry, cherry, citrons, custard apple, fig, gooseberry (Cape), granadilla, grape, guava, kai apple, kumquat, lemon, lime, loquat, mandarin, mango, mulberry, nectarine, orange, papaw passion fruit, peach, pear, persimmon, plum, and quince.

The period during which this Regulation shall operate has been extended from the 1st April, 1925, to the 31st March, 1926.

Poultry Diseases Declared.

The following poultry diseases have been declared to be diseases under and for the purposes of "*The Diseases in Poultry Act of* 1923":—

Avian diphtheria (canker or diphtheritic roup); bacillary white diarrhœa; chicken pox (Epithelioma contagiosum); contagious catarrh (non-diphtheritic roup); favus (Zophophyton Callinæ); fowl or chicken cholera (Septicemia hæmorrhagica); fowl enteritis; gapes (Syngamus trachealis); poultry lice (of all kinds); poultry tick (Argas persicus or other species of Argas met with in Australia); scabies (Sarcoptes lævis); stickfast flea (Echidusphaga Gallinacea); tuberculosis; tumour; vent gleet (Cloacitis).

World's Butter Championship.

The Premier (Hon. W. N. Gillies) has received particulars of the World's Butter Championship Competition to be held in connection with the Auckland (New Zealand) Winter Exhibition, 23rd to 31st July, 1925.

This competition is open to all countries and is for a box of butter, 56 lb., salted, suitable for export, to be packed in an oblong box, inside measurements—length 15⅛ in., depth 11⅛ in., width 10⅛ in., to be made of ½-in. timber. Exhibits from Australia, Fiji, and New Zealand are to be lodged with the Auckland Farmers' Freezing Company, Auckland, two months prior to the date of the Exhibition. Other overseas countries' exhibits one month prior to date of Exhibition. The packages are to be branded Class No. 1, and addressed to the Secretary, Auckland Winter Exhibition, Auckland, New Zealand. Oversea butter is to be enclosed in an outer case. The first prize is £50, the second £30, and the third £20. Gold medals and certificates in each instance. The entry fee is 20s., and the judging will be undertaken by a committee consisting of about twelve official graders of the New Zealand Government Dairy Service. The Secretary of the Exhibition is Mr. A. D. Stanley, P.O. Box 86, Auckland, New Zealand.

For Bees in Spring—Two Good Pollen-bearing Trees.

The development of colonies of bees in spring depends mainly upon the supply of pollen with which to feed the larvæ. A lack of this food invariably results in slowly developing colonies and sometimes in malnutrition of the larvæ, and consequently a weak stock of adult bees. Pollen shortage at the season mentioned can, however, be overcome to some extent by planting trees that yield this important element of bee-food in abundance. All practical apiarists recognise the foolishness of planting trees from which to gather a surplus of honey, but this does not apply in the same degree to food for the sustenance of colonies. Good pollen-yielding trees may be planted profitably where they will be accessible to bees, though it is not suggested that when such trees have been planted no pollen shortages will occur.

In the neighbourhood of Hawkesbury Agricultural College, Richmond, the pollen supply in August and September is not usually very plentiful. This has led to the close observation of bees' activities on certain trees near the apiary, with the result that two trees have been noted as being particularly valuable pollen-producers. The first, *Juniper virginiana*, is probably the better known. It blooms in August and yields pollen very profusely. When bees alight on the flowers the fanning of their wings is sufficient to dislodge the pollen grains, so extremely fine and light are they, and they rise in the air almost in the form of smoke. When this condition obtains bees do not work upon the tree so freely, probably because of the difficulty in collecting; they appear to work this tree best in the early morning before the dew has evaporated.

The other tree referred to is a handsome Mediterranean tree, *Celtus australis*. It is deciduous, has a spreading habit, attains a height of about 30 ft., and blooms for about two weeks late in August before its leaves appear. The manner in which the bees work upon this tree is truly remarkable, writes the apiarist at the institution referred to. The pollen is a dirty brown in colour, and is gathered by bees in large quantities.

Both these trees make ideal windbreaks, and would prove valuable sources of pollen in localities lacking in pollen-bearing flora in the spring.

One of the unsolved problems of commercial apiarists at the present time is the periodical pollen famine. The foregoing is not recommended as a solution, but the planting of good pollen-bearing trees is certainly a step in the right direction, however insignificant it may appear.

Lucerne—Rate and Method of Sowing.

The rate at which lucerne should be sown varies widely with the method and the district. In the regular lucerne districts of the State from 12 lb. to 15 lb., and even 20 lb., per acre is applied. For dry districts 10 lb. to 12 lb. will be found ample if evenly applied.

It is not wise to run the risk of a thin crop through a little parsimony in seeding. It is all-important, with a permanent crop such as lucerne, that a good stand should be obtained at the outset. Re-seeding cannot be done without again breaking up the land, and this means that a year or more is lost. If re-seeding is not done, the yields are permanently affected through the poor stand. Attempts are sometimes made to remedy unsatisfactory stands by sowing further seeds, but they are seldom successful. The soil is not in a receptive condition, and what plants do grow have to contend with established vigorous plants.

At the same time it is a mistake to endeavour to remedy defects in preparation, or in the state of the soil, by heavier seeding. Favourable conditions are required to promote germination and to help the young plant, and seeding should only be done after they have been obtained. If the ground should happen to be dry at seeding time, heavier seeding will not secure a proper stand.

Farmers generally prefer to broadcast the seed where the area is small, but sowing through the grass-seed attachment of the wheat drill is a useful method when the area is large.

A method of sowing that is well suited for wheat districts is to mix thoroughly 70 lb. of superphosphate with 10 lb. to 12 lb. of lucerne seed, put the mixture into the manure-box of an ordinary seed drill, and set the drill to sow about 80 lb. of manure per acre. The discs or hoes of the drill should not be set into the soil too deeply. Some drills, especially when new, cannot be set to a shallower depth than 1½ to 2 in.; in such a case a good plan to follow is not to set the lever of the drill into the first notch, but to let it dangle. The cogs of the drill will be in gear, but the hoes will not go down as deeply as if the lever had been set into the first notch. In this way the seed will be sown about ¾ in. deep. Special care must be taken not to fill the manure-box right up. Not more than sufficient seed and manure for 1 acre—*i.e.*, about 80 lb.—should be put into the drill at one time. In order that the seed may be thoroughly covered, it is advisable either to improvise a brush harrow at the back of the drill, or to harrow with light harrows after the sowing.

A fine, level, rolled surface is required for sowing. The seed must be covered not more than 2 in. deep nor less than half an inch, and to secure this, fineness is essential. An even distribution of the seed is required, and, although some men are sufficiently expert to obtain it by hand-sowing, that method is not recommended to the inexperienced. Many good machines are available which do the work satisfactorily.

If a farmer is compelled to resort to hand-broadcasting, half the seed should be sown in one direction across the paddock, and the other half at right angles across the first cast, so that strips missed the first time will receive some seed. Select a calm day or early morning, as it is hard to distribute the seed evenly on a choppy, windy day.

The seed should be covered with a light harrow, though a brush harrow is often used. Adjustable lever harrows are very effective for this work, as the depth can easily be regulated. The seed should not be covered deeply, and precautions must be taken to prevent a crust forming on the surface.

Lucerne sown in autumn should receive no cultivation until the following spring at earliest. The young plants are tender, and will not stand rough handling. On friable, loose soil especially the effect of cultivation would be to pull many of the plants out, and consequently the harrowing must be light, and should not be attempted until the roots have a firm hold; but after the second cut, particularly on ground that sets hard, the harrow can be used.

Farmers have so far given but little attention to the subject of varieties of lucerne, the local strains having such an advantage in acclimatisation as to make the discovery of a better a difficult matter. The Department of Agriculture of New South Wales has recently tested a number of lucernes from other lands, however, seed being obtained from time to time as the published reports appear to suggest their possible utility here. It is still extremely doubtful if any can be recommended in preference to the local strains—Tamworth, Hunter River, and Mudgee—that have been deservedly popular for so long.

The Theory of Dairy Feeding.

The dairy cow has often been likened to a machine. She is much more than that, of course, yet to think for a moment of milk production as a manufacturing process in which the cow is the machine, her ration the raw material, and her milk the finished product, will emphasise the need of proper care for the animal and intelligence in selecting her feed.

The animal body, points out an American departmental hand-book, may be likened to a steam engine. The engine must have three things to keep it going—first, it must have repair material, and if any part of the engine or boiler gives out, it must be repaired at once; second, it must have water, so that the energy of the fuel may be transferred to the engine; third, it must have fuel, to yield energy to do work.

In the same way, the body must have three things—first, it must have repair materials, for the body is continually wearing out. For this material a certain amount of protein must be supplied in the food. In contrast with the engine, when the body is given more repair material (protein) than is needed, the residue may be used for building new parts or producing energy. Second, the body must have a sufficient amount of water to aid in forming bones and new tissue, in the circulation of food material, and in the withdrawal of waste material. The water is supplied directly and in the succulent part of the food. Third, the body requires energy to do its inside construction work, to perform labour, to make milk, and so on. This energy is derived mainly from the carbohydrates and fat, and partly from the protein in the food.

To carry the analogy a little further: The engine and the boiler do not turn all the energy derived from fuel into power, but a good deal of the heat is lost in the air. In the same way energy is lost in the vital processes of the body and in keeping up the body heat. Then the engine loses part of the heat in ashes, because the fuel is not completely consumed. This corresponds to the part of the food the body fails to digest.

Preparing Poultry Show Exhibits.

The poor condition in which many of the utility birds are shown is a subject of comment at all shows where utility classes are provided, and never more so than at the two big metropolitan shows (writes the Poultry Expert of the New South Wales Department of Agriculture). This applies to all breeds, more or less, but particularly to White Leghorns, either because they have not been washed or because they have been badly washed. In many cases bad washing is worse than no washing at all—the result of lack of experience and want of knowledge on the part of the owner.

To wash a bird plenty of warm water and towels and three large bath tubs should be provided, and a coop that is lined with clean crash or some such material. This coop should be placed either in the sun or before a stove, so that the bird can be put into it to dry. If it is in the sun, care should be taken to protect the white lobes, or they will be scalded, and the result will be blisters that later on will leave red spots in the lobe and cause the skin to become creased and wrinkled.

In the actual washing of the bird it is necessary to have three waters, the first being the soap water. To make this, about a quarter of a pound of good soap (white Castile is best) should be cut into slices and dissolved in about half a gallon of hot water. Pour into this about 5 gallons of luke-warm water, and into the lot plunge the bird—over the head to start with, and then holding the head out of the water while the lather is rubbed well into the feathers. And now comes an important point: the bird must be thoroughly soaked, and sufficient time given in soaking to loosen the dirt. Usually about ten minutes is required, but the dirtier the bird the greater the length of time necessary in this bath.

Next put the bird through a rinsing water, which will remove the soap—there must be plenty of water to do this thoroughly—and then into the third bath, to remove the last possible trace of soap. Failure to remove all the soap means a quite inefficient washing. Most poultry exhibitors use the laundry blue-bag in this last water, but it must be employed sparingly, and the water must not be made darker than a light sky-blue. Finally, stroke all the water possible out of the feathers, and dry off with clean towels. The bird should then be put into the drying coop, and every care taken to avoid dirt or dust.

The operator should be seated on a low stool or chair while at work, with a pad of sacks covered with a clean towel over his knees. Washing should be done one or two days before the day of showing to allow of the bird 'preening'' his feathers to web them out. It is fatal to good results to wash a bird twice inside one week. Therefore it is necessary to make sure of the first operation. Amateurs should practise on a bird not intended to be shown in order to get used to the work.

The Pig's Tail.

The curl in the pig's tail is said to be a sure indicator of the state of his health. Some breeders assert that a straight-tailed pig is discontented and a feed waster. In health, the tail is curled and carried in a characteristic way, whereas in a sickly animal the tail is often carried loosely and hangs in a limp fashion. One will often notice, however, that in aged pigs the tail is not always curled. Sometimes it hangs free and is switched about in the same way as the tail of a horse or cow. Even in these cases the way in which the tail is moved indicates whether the animal is in good heart or is sickly and disinclined to move about.

Vermin in Poultry Houses.

The best method of clearing poultry houses of vermin and keeping them free is to spray them with kerosene emulsion as frequently as may be necessary.

To make the emulsion, take 8 oz. of soft soap and dissolve it in 1 gallon of boiling water; take the mixture off the fire and add slowly 1 gallon of kerosene, stirring all the time. This mixture should be agitated briskly until the oil and the soapy water are thoroughly emulsified. These 2 gallons are then designated "stock." Add to this 10 gallons of soft water. Hard water will not do; nor should lime or any caustic substance come in contact with it, or the result will be that the oil will separate from the soapy water and the emulsion will be spoiled.

If it be desired to make the spray also a disinfectant, add 1 tablespoonful of miscible carbolic acid to each gallon of emulsion. The whole should be kept well stirred, especially when adding water.

A spray pump and hose, similar to those used by orchardists, should be used to force the emulsion into all cracks and crevices about the poultry houses. A small force-pump suitable for this work is obtainable, which can be stood in a kerosene tin and held down by means of a footrest that is provided. The whole, with a short length of hoze and nozzle complete, is obtainable at about 22s. 6d. in Sydney.

In cases where the infestation is bad one spraying is not sufficient—two or three may be necessary at intervals of a day or two between each.

Should the vermin be confined to the roosts, these might be washed over with a brush in place of spraying.

Tonics for Poultry.

What is known as Douglas mixture is recognised as among the best tonics for general use in the poultry yard. The method of making and using it is as follows:—

Take 4 oz. of sulphate of iron and 4 oz. of Epsom salts, dissolve in 1 gallon of boiling water, let it cool, then add ½ oz. of what is sold by the chemist as dilute sulphuric acid; bottle and put away. One teaspoonful of this mixture might be added to each pint of drinking water; this might be used three or four times per week for three or four weeks at a time.

Great care is necessary when handling sulphuric acid. It should only be poured slowly into the mixture, and only earthenware vessels should be used when preparing the stock mixture. No special drinking pots are necessary, for the small amount that is used in the water will not damage iron vessels to any appreciable extent. The case is different with tin-ware, such as kerosene tins, for they are readily destroyed by the use of Douglas mixture owing to the occurrence of what are known as pin-holes in the tin.

Syrup of iron is also a useful tonic. The quantity to use is a teaspoonful to a quart of drinking water, given in the same way and under the same conditions as Douglas mixture.

Over-Production of Sugar.

At its last meeting in Brisbane the Central Sugar Cane Prices Board had before it several applications for assignments of new land. In view of the serious position created by over-production of sugar in the State—200,000 tons—the Board considered the matter very carefully and came to the conclusion that it will not make any further assignments of new land for the present. The price realised for exported sugar will so affect the price which can be paid by the Sugar Board for raw sugar that a most serious position for those already in the industry will arise. The general position of the sugar industry has reached a serious stage owing to the over-production of the 1924 season and the larger prospective over-production of the 1925 and future seasons. This question of over-production must be seriously faced and some way found to overcome the difficulty that has arisen. In the meantime the Board considers it advisable to keep production within bounds so far as it can. It, therefore, does not intend to allow the area under sugar-cane to be increased by assignments of any new lands.

STANDARD POULTRY.

In reply to an inquiry for the Show Standard of the White Leghorn, the Poultry Instructor, Mr. Rumball, supplies the following information, and recognising that the producing powers of stock governs their true value recommends an earnest study of the Utility Standard characteristics of the cock.

Characteristics of the Cock.

Head and Neck.—Skull fine; beak stout, the point standing well clear of comb but not too long. Comb, fine in texture, large but not overgrown, perfectly straight and erect, deeply and evenly serrated, the spikes broadening at the base; extending well beyond the back of the head and following, without touching, the line of the hackle, free from thumb marks and side sprigs.

Face.—Fine in texture and free from wrinkles. Wattles long, thin and fine in texture. Lobes well developed and rather pendant, smooth and free from folds. Neck moderate length and full in hackle.

Body.—Wedge shaped, wide at shoulders, and narrowing to the root of the tail. Breast round and prominent, breastbone straight. Back slightly rounded and sloping to tail. Wings large but tightly carried. Tail moderately full, carried at an angle of 40 deg. to 45 deg. Legs long, the shanks free from feathers. Feet well spread and toes long and straight. Carriage upright. Size medium, 6 lb. to 8 lb.

General Characteristics of the Hen.

With the exception that the comb falls gracefully over to either side of the face, and the tail carried closely, and not at such a high angle as the cock, the general characteristics of the hen are similar to those of the male bird, allowing for the natural sexual difference; weight 5 lb. to 7 lb.

Beak, toes, nails, and legs yellow. Eye red; comb and wattles bright red. Face bright red without traces of white. Lobes white or cream, the former for preference. Plumage, pure white.

UTILITY STANDARD.

Type, colour (plumage and lobes), legs and feet (colour), condition, health, furnishing brightness and cleanliness of feathers and legs, in accordance with accepted standard of the breed.

Laying Characteristics (any breed).

Conformation.—(*a*) Length, depth, and width proportionate to the type of the breed; (*b*) length, as taken from the base of the neck to the base of the tail; (*c*) depth to be determined by the vertical space between the back and the breastbone and between the end of the breastbone and the pelvic bones; (*d*) width, as measured across the saddle and immediately behind the wings, and as indicated by the distance apart of the legs.

Freedom from Coarseness.—(*a*) Shanks strong as differentiated from either extreme coarseness or fineness of bone; (*b*) pelvic bones strong at base, long, fine, and straight; (*c*) tissue pelvic bones to be as free as possible from gristly covering.

Head.—Finely modelled skull, deep over eyes, full and rounded at back.

Eyes.—Full, bright, and expressive.

Face.—Bright and lean, free from feathering, and not sunken.

Comb and Wattles.—Neat, fine in texture, and medium in size, avoiding beefiness.

Neck.—Fine, and fairly long.

Skin and Abdomen.—Texture of skin to be of the thinnest and finest quality and pliable; abdomen to be elastic, avoiding sagging in, or fulness indicating excess of fat.

Plumage.—Feather soft and silky. Close but not hard as in game. Fluff moderate.

Weights.—Light breeds, ½ lb. to 1 lb. above minimum, and heavy breeds 1 to 1½ lb. above to score maximum points; if in excess to be cut correspondingly.

Leghorns, Minorcas, Andalusian, Spanish, Campines, Buttercup, Anconas: Cockerel, 5 lb.; pullet, 4 lb. Orpingtons, Plymouth Rocks, Rhode Island Reds, Sussex: Cockerel, 7 lb.; pullet, 5 lb. Langshans and Wyandottes; Cockerel, 6 lb.; pullet, 4½ lb.

Answers to Correspondents.

"Wild Lucerne" *(Stylosanthes mucronata).*

A botanic specimen forwarded by a correspondent has been identified by the Government Botanist, Mr. C. T. White, F.L.S., as *Stylosanthes mucronata,* commonly known is Queensland as "Wild Lucerne," a native of the West Indies and Tropical America, naturalised in North Queensland and Tropical Asia. The plant is an annual and was at first looked upon as a pest, but soon proved itself to be a most valuable fodder. It is palatable to stock, and chemical analysis has shown it to have about the same nutritive value as lucerne.

Glycine tabacina.

C.R.A. (Blackbutt)—

The Government Botanist, Mr. C. T. White, F.L.S., has identified your specimen and advises:—The plant is *Glycine tabacina,* a small blue or purple flowered legume allied to the Trefoils. I have not heard a common name applied to it, but it is abundant in Queensland pastures, and is generally looked upon as a useful addition to the pasture and in no way harmful to stock. I do not know your correspondent's property, but if the cattle have access to scrub edges or scrub undergrowth it is in these places that very often cattle pick up poisonous plants. Any further specimens of suspected weeds your correspondent may care to send I will gladly report on.

Sudan Grass and Jap. Millet.

C.R.A. (Blackbutt)—

The Director of Agriculture (Mr. H. C. Quodling) advises:—Sudan grass appears to be quite safe to graze cattle on once it comes out into head; prior to that time, however, there is an element of risk. Seeded second growth is not safe pasturage. In fact, if this second growth receives a check and shoots again quickly it is generally regarded as particularly dangerous to stock.

Symptoms of poisoning with sorghums and Sudan grass (Sudan grass is actually a sorghum) are as follows:—The animals stop eating suddenly and throw up their heads as if something had alarmed them. The eyelids begin twitching and the beast trembles all over; this latter symptom commences at the head and works back to all the limbs. The animal soon drops, and while the spasms are on appears to be completely paralysed in all the limbs, and bellows with pain.

Some have up to three spasms before dying, and appear quite easy between spasms. They attempt to rise, but seem to be only able to prop themselves up temporarily on their forefeet. In one case the animal when first seized with the pain reared right over on her back and died.

As a matter of fact, poisoning is very rapid in its action, many animals dying within ten minutes or a quarters of an hour after feeding on the crop. It would be hard to express an opinion respecting your bull. Cattle turned in on to green fodder very often become blown (Hoven), particularly if they are not used to it. In all circumstances it is advisable to accustom the cattle gradually to a change of diet.

The Chief Inspector of Stock considers that, in the event of animals showing signs of poisoning (sorghum) one of the best remedies is an ample supply of molasses. Up to 4 quarts can be poured gently down their throats, or given by means of a bottle.

Jap. Millet.—Jap. Millet is not usually considered to be poisonous to stock; however, don't run any risks with the crop if you have valuable animals, better to try two or three on the crop and watch the effect of the change of feed.

This Department has not had any cases of poisoning reported to it through stock feeding on Japanese Millet in its young stages.

Sows Going Dry after Farrowing.

A correspondent writes:—"There are a lot of complaints in this district of sows going dry as soon as they pig. Some of them dry off altogether, some partially, and some make milk and seem all right in a few days. What is the cause, and remedy?"

The Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A., advises:—There can be but one or two reasons for sows going dry within a day or two of farrowing. First of all, it is evident that the sows are either too fat or too poorly nourished. Sows that are too fat and lethargic (lazy) and that invariably suffer from constipation frequently suffer from an insufficient milk supply for their piglings, particularly if the sows are overfed at farrowing time; indeed, they frequently develop milk fever and either lose their milk altogether or are sickly for a week or more, during which time their pigs die unless taken care of and specially bottle fed, &c. Sows that are in very low condition and that are poorly nourished also occasionally exhibit similar symptoms, though it is the fat sow that suffers the most.

Without an inspection of the affected animals it seems that the feeding is at fault, for it is unnatural for a sow to have an insufficient supply of milk for her pigs, and sows in a normal condition and that are properly fed will rarely suffer, and if they do it is usually due to accidental causes and not the conditions referred to above.

Unfortunately, in these days when show pigs are exhibited in excessively fat condition, it frequently happens that these sows (and also sometimes their progeny) will prove very poor milkers, and some strains of Berkshires particularly seem to have a very poor milk supply, this fault apparently also having hereditary tendencies.

There is no specific disease affecting the udder or teats or the milk supply of the sow which would cause the symptoms you refer to, nor would it be caused by any other specific disease to which the pig is subject, except in cases where the animal was in an anæmic condition and was suffering from disorders of the blood.

Careful attention to the feeding of the sows, keeping them in normal breeding condition only, seeing that their bowels are normal, and that they are not overfed (this is most important) at farrowing time will overcome the difficulty.

Milk Fever in Pigs.

J.E.C.J. (Mt. Larcom)—

The Instructor in Pig Raising, Mr. E. J. Shelton, advises:—Milk fever or inflammation of the udder is an affection common to breeding sows, especially those that are fat when the farrowing period arrives. To avoid troubles of this description, as well as bowel troubles generally, it is recommended that each sow due to farrow be given a good dose of castor oil (ol Ricini ital), say 3 or 4 oz. (one tablespoonful equals about 1 fluid oz.), about three days before due date. This oil should first be mixed in about 1 quart of dry bran or pollard and meal, then, when thoroughly incorporated, thin the mash down with warm water or milk to the consistency of thick cream and give as the first feed of the day, and whilst the sow is hungry. Follow in about two hours' time with the usual allowance of (warmed) skim milk, to which has been added about half a teaspoonful of salt (ordinary table salt); about two hours afterwards compel the sow to take exercise to relieve the bowels and bladder. Feed on a very light diet of nourishing slop and give abundant supplies of green food and a liberal supply of clean drinking water.

Milk fever follows after farrowing and is frequently due to the sow developing a high temperature, being constipated and overfed. It is more frequent during extremely hot or very cold weather than during normal weather, for the reason that if the sow is at all sickly she becomes drowsy and will not take exercise. Sometimes in very nervous excitable sows the trouble is caused through the suckers biting the teats and thus causing the sow to withhold her milk supply. This results in an accumulating of milk in the udders and inflammation.

Sometimes the sow will develop cowpock on her teats. This causes them to be very swollen, tender, and painful. In these cases it is advisable to nip off the points of the very sharp black tusks with which the suckers are provided, and which they use freely in fighting for a place at the teat.

A good ointment to use in these cases is made up of borax and glycerine, which should be applied after the udders have been washed with warm water.

Another very useful healing ointment is made up as follows:—Iodoform, 1 oz.; oil of eucalyptus, 14 oz.; olive oil, 20 oz. Dissolve the iodoform in the oil of eucalyptus, then add the olive oil.

If the sow is unable to urinate freely she should be given teaspoonful doses of sweet spirits of nitre in a small quantity of drinking water and be compelled to take exercise regularly.

Careful attention to the comfort of the sow and a liberal supply of green food will usually effect a cure, but it is usually necessary in severe cases to bottle feed the young pigs for a few days until the sow recovers her milk, and until they learn to drink from a small trough themselves.

BUTTER IN THE HAMILTON COLD STORES.

The Minister for Agriculture (Mr. W. Forgan Smith) was asked recently whether butter was being stored at the Government Cold Stores, Hamilton. The Minister replied that in accordance with the promise he had given to the deputation which had waited upon him, he had arranged to open a section of the Cold Stores, at Hamilton, in order to provide satisfactory cold storage accommodation for dairy produce, which was coming forward in quantities in excess of the capacity of the stores customarily available.

In the third week in March the cold chambers at the Hamilton contained something more than 20,000 boxes of butter, which had been cooled down to a low temperature preparatory to shipment overseas. The Stores were opened solely for the reason of assisting manufacturers and exporters of dairy produce, and they will be closed immediately it is found that there is sufficient cold storage accommodation elsewhere to cope with the dairy produce coming to hand, and not opened again until the installation of the machinery and general equipment of the Stores is completed.

Some complaint had been raised concerning the length of time occupied in the construction and equipment of the Cold Stores, but against this it is to be recognised that the construction of a Cold Stores and wharf of the dimensions of those at the Hamilton is not by any means a minor undertaking, particularly, too, as the construction was carried through at a period when conditions were abnormal in many respects. Additionally it must be remembered that the building throughout is of reinforced concrete, and each section of concrete requires time to set after it is laid down.

Shortage of material at one stage and scarcity of plasters at another period are among the factors contributing towards length of time taken in the completion of the structure. However, the Works Department is generally abreast or ahead of the contractors for the installation of the machinery. The interests of primary producers have been adequately safeguarded throughout the period of construction, and arrangements were made by the Minister at an early stage to complete several cold chambers so that space would be available for the storage of dairy produce in case of emergency. These rooms were in readiness two years ago to receive dairy produce. Unfortunately, they were not needed until quite recently, because of the indifferent seasons that had been experienced.

The Stores will be a valuable asset to this State. The rupture in shipping facilities which occurred during the war emphasised the pressing need for up-to-date cold stores, and I feel confident primary producers will realise the advantage the Stores under Government control will be to them. They will be an important factor in the further development of primary industries in Queensland.

The gross cubic content of the Stores is approximately 1,750,000 feet, and in equipment generally compares favourably with any other cold storage lay-out in the Southern Hemisphere, and has the distinct advantage of wharfage accommodation, thereby enabling frozen produce to be loaded direct from the cold chambers into the ship's hold.

Farm and Garden Notes for May.

Field.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late maturing varieties should be in the ground by the middle of the month at the latest.

Cleveland, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Malting, Cape, and skinless barley may be sown; also Algerian and Sunrise oats and canary seed.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Although a little late in the season *Phalaris bulbosa*, a perennial, and *Phalaris minor*, an annual type of canary grass, should be sown in the more temperate of the Southern districts of the State. In these areas increased attention should be given to the introduction of a hardy clover, like the White Dutch, to artificial pastures. Clovers usually thrive best when sown in April, but seed may still be sown early in May, provided weather conditions are propitious.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. Growers are advised that cotton in the Central District should be consigned to the Australian Cotton-growing Association, Rockhampton, and Gladstone for Durango; whilst those in the Southern areas should consign their cotton to the Association at Whinstanes, Brisbane. All bags should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Kitchen Garden.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean and well-prepared ground. In favourable weather plant out cabbages, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots, and, where sufficiently large enough, thinned out. Dig and prepare beds for asparagus, using plenty of well-rotted farmyard manure.

Flower Garden.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE COASTAL DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become specked or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ in. in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. in diameter in a single layer.

Slowly acting manures—such as meatworks manures—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out in a droughty season.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—not *vines*, as the later vines are pruned in the season the better in the Granite Belt District, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manures—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for the use of the trees or vines during their spring growth. Lime may also be applied where necesary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

ARROWROOT POOL.

The following nominations have been received for membership on the Arrowroot Board for the year ending 9th March, 1926:—

A. Clark, Pimpama; C. D. Gordon, Redland Bay; A. McG. Henderson, Redland Bay; J. Lahrs, Pimpama Island; B. G. Peachey, Norwell; R. Stewart, Ormeau.

Mr. C. D. Gordon subsequently withdrew his nomination, and in consequence thereof no election will be necessary.

WHITE SETTLEMENT IN THE AUSTRALIAN TROPICS.

By the HON. E. G. THEODORE.*

Can white people live, work, and thrive in tropical Australia? This question causes grave concern to a good many persons here and abroad who have little knowledge of the nature of the problem, or of the experience already gained in Queensland.

I was present at a West End club in London last year, when a discussion arose on this very problem. An Anglo-Indian asserted that no country in the torrid zone had in any period of history ever been effectively settled by a white race. I dissented from this sweeping assertion, and quoted Queensland, where 250,000 white people are at present settled north of the tropic of capricorn. Yet the Anglo-Indian's assertion as a generalisation is accurate enough, though its implications are false. What is actually meant by such assertions is that no white race ever fully occupied a country in tropical regions and made a permanent abode there, and that, therefore, no tropical country is suitable climatically as a permanent home for people of that race.

On that contention it will be sufficient to say that so far as history teaches, the Nordic races in their early wanderings and migrations to tropic countries, always found those countries more or less densely occupied by black, brown, or yellow people, and although able to conquer and assume a political ascendency in a great many instances, were never able to establish a permanent home for the propagation of a pure white stock in a tropic land.

But the problem of a tropical Australia is different to that of any other country invaded by whites. In the first place the whites found Australia practically unoccupied. The handful of aborigines were wholly hunters and fishers, and had no compact settlements, nor dense communities, in any part of the continent. White occupation was achieved by settlement, and not by conquest. The whites busied themselves with pastoral, agricultural, and mining pursuits—means of livelihood totally unknown to the primitive native inhabitants. The aborigines proved useless as a labour factor in the white man's industries, and the numbers of the former diminished with tragic rapidity with the advance of white settlement. The reproductive rate of the aborigine—apparently never very high—diminished to vanishing point at every place of contact with white civilisation. Hence the problem of economic competition with a frugal native population, which is the chief factor in the riddle of the failure of white settlement in all other tropical countries where the experiment was tried, was non-existent in tropical Australia.

White labour, which is at present working a great variety of industries in North Queensland, would quickly be replaced by Asiatics if the immigration barriers were removed, and this displacement of the whites would be effected not because the Asiatic is superior to the white as a worker, and a dweller in a tropical country, but because his standard of living is lower, his wants are simpler, and the cost of his labour on a corresponding lower scale.

For the same reason the white worker could not compete with the Asiatic in Japan—which is not in the torrid zone, but approximately in the same latitudes as Southern France and Spain. Nor could the white compete industrially in Europe or North America with the Asiatic, if a few million of them got a foothold in those countries.

Another vital point which must not be overlooked is that Northern Australia, though lying within the torrid zone, is not entirely a land of miasmic swamps, impenetrable steaming jungle, the haunts of alligators and breeding ground of malaria, which the mind is apt to conceive as the invariable conditions in the tropics. More than 90 per cent. of the area of tropical Australia is open forest country, and elevated tablelands and plateaus. The abnormal rainfall and excessive humidity in low-lying regions which constitute the climatological features of many equatorial countries is almost absent from Northern Australia, being present only along a narrow strip of the eastern coast of North Queensland.

White settlement in North Queensland has been proceeding steadily since 1870, and received a great impetus on the discovery of gold at Charters Towers in 1872, and on the Palmer in 1873. At the present time the white inhabitants of tropical Queensland number 250,000. There are about 4,000 coloured aliens. Apart from negligible labour of these latter all manual and other work necessitated by the industries in the North is performed solely by white workers. Mining, canecutting, railway navvying, wharf lumping, timber getting, and sheep shearing involve the

* In "Stead's Review" for March (abridged).

most arduous toil men are called upon to perform in any country; yet these are carried on at all seasons of the year in tropical Queensland by white workers. The mill and field work in the sugar industry was at one time carried on by South Sea Islanders; since 1905 these have been replaced by white workers, whose work is acknowledged to be 100 per cent. more efficient than that of the kanakas.

Suggestions of race deterioration which one sometimes hears are without a tittle of justification. The Australasian Medical Congress at its sittings in Brisbane in 1920 considered this subject, and as a result of the investigation of all available material, passed the following resolution:—

"After consideration of sources of information, embodying the results of long and varied professional experience and observation in the Australian tropics, congress is unable to find anything pointing to the existence of inherent or insuperable obstacles in the way of permanent occupation of tropical Australia by a healthy, indigenous white race."

If North Queensland were an unhealthy country for white people the effects would be reflected in the vital statistics of the State. The death rate there compares most favourably with that of other States and Territories.

The proportion of deaths of infants under one year of age is also significant.

A still more striking result is obtained by comparing the death rate in Queensland with that of the leading European and other countries. The Queensland rate is lowest of all.

Dr. R. W. Cilento, Director of the Australian Institute of Tropical Medicine, in a brochure dealing with climatic conditions in North Queensland as they affect the health and virility of the people, remarks that "the death rate, when worked out on as complete a basis as possible with regard to the hospitals of the North, showed that tropical Queensland had a smaller death rate in nearly every instance than the Southern and Central districts. The exceptions consisted (1) in tuberculosis (of which a large proportion doubtless seeks the warmer climate of the North from Southern Australia), and (2) in senile decay, and old age, which can hardly be a charge *against* the climate.

The answer to the query at the beginning of this article is an emphatic affirmative. White people not only can, but do, work, thrive, and multiply in the tropics of Queensland. The land, the climate, and the conditions are in every sense suitable to the permanent settlement and propagation of a healthy, virile white race.

Plate 67.—Ensilage Making at the Farm Home for Boys, Westbrook, near Toowoomba.

Boys at work building a stack. While less economical than pit or tub silos, the stack is a valuable drought or winter-feed standby.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	MARCH.		APRIL.		MOONRISE. MAR.	APR.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	p.m.
1	5·44	6·24	6·1	5·50	11·18	12·33
					p.m.	
2	5·45	6 23	6·2	5·49	12·11	1·23
3	5·46	6 22	6·2	5·48	1·2	2·8
4	5·46	6·21	6·3	5·47	1·54	2·51
5	5·47	6·20	6·3	5·46	2·43	3·30
6	5·48	6·19	6·4	5·45	3·29	4·9
7	5·48	6·18	6·4	5·44	4·14	4·47
8	5·49	6 17	6·5	5·43	4·55	5·22
9	5·49	6·16	6·5	5·42	5·34	6·0
10	5·50	6·15	6·6	5·41	6·12	6·41
11	5·50	6·14	6·6	5·39	6·51	7·25
12	5·51	6·13	6·7	5·38	7·27	8·12
13	5·52	6·11	6·7	5·37	8·5	9·3
14	5·52	6 10	6 8	5·36	8·45	9 58
15	5·53	6·9	6·8	5·35	9·29	10 58
16	5·53	6 8	6·9	5·34	10·17	11·59
17	5·54	6 7	6·10	5·33	11·7	...
					...	a.m.
18	5·54	6·6	6·10	5·33	a.m.	1·1
19	5·55	6·5	6·11	5·32	12·3	2·3
20	5·55	6·4	6·11	5·31	1·2	3·4
21	5·56	6·3	6·12	5·30	2·6	4·3
22	5·56	6·1	6·12	5·29	3 8	5 0
23	5·57	6·0	6·13	5·28	4·13	5 58
24	5·57	5·59	6·13	5·26	5·13	6·55
25	5·58	5·58	6·14	5·25	6·15	7·48
26	5·58	5·57	6·14	5·25	7·13	8·43
27	5·59	5·56	6·15	5 24	8·9	9·36
28	5·59	5 55	6·16	5·23	9·5	10·28
29	6 0	5·54	6·16	5 22	9·59	11·18
						p.m.
30	6·0	5·52	6·17	5·21	10·47	12·4
31	6·1	5·51	...	...	11·42	...

Phases of the Moon, Occulations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

2 Mar.	☾ First Quarter	10 7	a.m.
11 „	○ Full Moon	12 21	a.m.
18 „	☽ Last Quarter	3 21	a.m.
25 „	● New Moon	12 3	a.m.

Apogee on the 4th March, at 11 36 p.m.
Perigee, on the 20th March, at 10 54 a.m.

The sun will pass to the Northern side of the equator on March 21st when the Equinox will occur, thus dividing the twenty-four hours equally between day and night.

THE PLANETS.

Mercury will be in superior conjunction with the sun on the 5th at 11 0 p.m.: that is, it will be on the farthest side of its orbit beyond the sun, when it will be quite unobservable.

Saturn will be in conjunction with the moon a little after midnight on the 14th, when both will be high up in the sky towards the N.W. Saturn will then be at a distance of about five diameters of the moon from it towards the South. Mercury will be at its greatest elongation east of the sun soon after midnight on the 30th.

1 April	☾ First Quarter	6 8	p.m.
9 „	○ Full Moon	1 33	p.m.
16 „	☽ Last Quarter	9 40	a.m.
23 „	● New Moon	12 28	p.m.

Apogee, 1st April at 7 48 p.m. and on the 29th „ at 3 0 p.m.
Perigee, 14th „ at 8 12 a.m.

THE PLANETS.

Venus will be in superior conjunction with the sun, that is on the far side of its orbit beyond the sun, and nearly in a line with it on the 23rd at 9 a.m. It will therefore be lost to sight during the greater part of this month.

Mars will be getting lower down towards the west when the sun sets and will become invisible by eight o'clock soon after the early part of the month.

Jupiter will not rise until near midnight on the 1st, but about 10·50 p.m. on the 15th. It will be in conjunction with the moon on the 16th at 3·27 a.m. and should form an interesting spectacle in the northern sky.

Saturn will be in conjunction with the moon at 5·15 a.m. on the 11th, Saturn being at a distance of about five times the diameter of the moon from it when both are low down towards the west.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The results of Northern fertiliser trials in connection with the cultivation of winter green fodder and cucumbers are set out by Mr. Pollock. Mr. Swain's paper on forestry "From Savagery to Silviculture" is a timely contribution to current thought on Australia's forest problems. Our present forest position is not altogether a base for undue optimism, and some of our most valuable timbers have already been listed among our vanished or vanishing assets. In an intelligent and educated democracy the need for scientific use and control of natural resources should be a country-wide recognition. Australians have been accused of unforgiveable national vandalism in this regard, but whether that is so or not, our national lack of an adequate forest sense is only too apparent to anyone who takes the trouble to measure the extent of our wealth in native timbers. Mr. Swain does well in calling attention to the fact that one of this State's most pressing responsibilities is wrapped up in a practical recognition of scientific forestry practice. The human and material resources of Australia are estimated by Mr. Stirling Taylor in a topically interesting paper. A short note on poultry on the farm is Mr. Rumball's contribution to this month's pages. Mr. Shelton's main topic is the weaning of pigs. Mr. White's notes on the weeds of Queensland continue as a valuable serial feature. The subject of fruit fly parasitism is discussed by Messrs. Perkins and Hardy of the Queensland University. Included in reprinted matter is a paper on the higher agricultural education of the future, and a topical note on cassava.

Anzac.

The epic of Gallipoli, that great episode in recent Australian history, was fitly and amply commemorated in every town and hamlet of Queensland on 25th April. It was a day of reverent remembrance of those young Australians who as members of the great Companionship of the A.I.F. offered their gift of vigorous youth and life on the altar of human liberty. With them freedom was more than a word, it was a work and a philosophy.

A Great Chief Justice.

All Queensland was shocked at the tragically sudden death of Chief Justice T. W. McCawley on 16th April. A Toowoomba lad he rose step by step unaided, except by force of exceptional character and his own bright intellect, from a humble beginning to the highest and most dignified office in the gift of his native State. He was only in his forty-fourth year, yet the achievements—achievements already a part of our history—of his brief life marked him out as a great Australian and one unusually gifted in character and ability. His work as President of the Arbitration Court had already become a theme, untiring in its interest, in the several schools of economic thought. The sad irony of it is that the man who was engaged in the task of reducing or regulating hours and conditions of labour should himself fall a victim to long hours of overtime, overwork, and overstrain. Of rural economics the late Chief Justice was a close student, and in agriculture generally his interest, due no doubt to his early country life, was unusually keen. "The country lives that produced him. The country that produced him may yet produce others like him, and in the meantime it is rich in his memory, rich in his life, and rich above all in his animating and inspiring example."

"The late Chief Justice was an extremely able man, and his loss will be mourned by all those with whom he came in contact," said the Minister for Agriculture and Stock (Hon. W. Forgan Smith), in the course of a Press comment at Hobart when he received a telegram from the Premier (Hon. W. N. Gillies) advising him of the death of Mr. Justice McCawley. "This came as a great shock to me," continued Mr. Smith, "as the Chief Justice was still a young man whom one could expect to have before him many years of service. He was a singularly able Arbitration Court judge—probably the most able in Australia of his time. Prior to taking over the office of Minister for Agriculture, on 26th February, I was for about five years Minister for Works, and in the course of that period I had many opportunities of realising the important nature of the duties performed by the President of the Arbitration Court (Mr. Justice McCawley). The Full Court, presided over by the late Chief Justice, recently heard argument in reference to the fixing of the basic wage, and had before it a report of the recent Economic Commission which had been appointed on his advice. The decision in that matter was reserved, and, of course, has not yet been delivered."

The Late Mr. W. Soutter.

The late Mr. W. Soutter, who died on 17th April, was a man of remarkable gifts and untiring energy. He was educated for the medical profession at the Aberdeen University, Scotland, but his life interest was in horticulture. As manager of the Acclimatisation Gardens, at Bowen Park, Brisbane, he gave inestimable service to the State. Experimental work in relation to introduced plants was one of his many activities at the gardens. He was not only a capable horticulturist, but an enthusiast who threw his whole energies into experimentation for love of the work. In the introduction of new sugar-cane varieties he was especially interested, and as a result some of the most useful canes were brought under tribute to the Queensland sugar industry, the success of which is largely built on this early experimentation. In cotton and other branches of primary production Mr. Soutter also led the way along safe and scientific lines. In 1898 Mr. Soutter entered the service of the Department of Agriculture and Stock as Inspector of State Farms. He was regarded as one of our best horticultural judges, and under the auspices of the National Association, he did good service for many societies of horticulturists and fruitgrowers within the State. After leaving the State service Mr. Soutter continued practical work in horticulture on his own properties, first at Sandgate, and then at Sunnybank. Mr. R. E. Soutter, the noted wheat breeder and manager of the State Farm at Bungeworgorai, near Roma, is a son of the late Mr. Soutter.

The Late Mr. James Mitchell.

The late Mr. James Mitchell, who died on Easter Sunday, devoted many years of his very useful life to agriculture in Queensland. At the time of his death he was officer in charge of the Departmental Experimental Nursery at Bribie Island. Prior to his appointment to that position three years ago he was an instructor in fruit culture, and was for five years manager of the Westbrook Experimental Farm, and for sixteen years Curator of the Acclimatisation Society's Gardens where, like the late Mr. Soutter, he did very notable service for the State.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

Mr. W. Cottrell-Dormer, who is investigating pests and diseases, reports (3rd March, 1925) to the Director (Mr. H. T. Easterby):—

Mossman.

Two serious "hereditary" diseases were met with in this area, *i.e.*, diseases which are perpetuated by the use of diseased plants; these were Leaf Stripe and Leaf Scald. Sclerotial disease Marasmius, and Rust are also fairly prevalent, though they are not doing serious damage.

Leaf Stripe.—Leaf Stripe has occurred in this district for a good many years, nevertheless, although the growers have before to-day suffered serious losses through it, they do not at present appear very keen on carrying out advice given them on the matter. However, by continued repetition of advice it will gradually be impressed upon the cane-growing community that cane diseases are really worth while taking notice of, so I will repeat here a description of this most destructive disease in order that those who have not already got Leaf Stripe in their fields may be on the watch for it. Incidentally, I recommend that growers preserve this and other disease descriptions, so that when they find suspicious signs in their fields they can at once refer to their scrap books in order to compare the said signs with descriptions of disease; should the signs agree with a description, steps can then be at once taken to prevent spread of the disease without working in the dark through lack of knowledge of which disease is being dealt with.

The chief symptom of Leaf Stripe is the presence in the early stages of vivid wide yellow stripes with serrated edges. On the under side of affected leaves, wherever the stripes occur, will be seen a light white mould which comes off at a touch of the finger. At a later stage the ends of the leaves turn a reddish brown, and rusty red patches appear on the leaf which has by now become yellow throughout. A more advanced stage again is the presence in some stools of long thin stalks which shoot up a foot or more over the tops of the surrounding stems. This is the appearance of affected cane during the warmer months of the year. During the winter another stage, known as the shredded leaf stage, is fairly common. The shredded leaf stage consists of a thorough splitting of the leaves of affected stalks which will then soon perish.

Given suitable weather conditions, Leaf Stripe is a very infectious disease, its spores being disseminated amongst infected cane by the wind. It does its worst damage in ratoon cane in badly drained land, and through its agency ratoons of certain varieties will sometimes fail completely. In the Mossman district the varieties most affected are B. 147 (which is otherwise proving a valuable cane in certain soils), M.Q. 1, D. 1135, and H.Q. 426, though the two latter are, comparatively speaking, but slightly infected. A little B. 156 is also grown here, but, although a very susceptible variety, has not yet taken the disease. During the course of my visit I made careful inspections of grasses growing in and about infected fields but found no trace of Leaf Stripe in these. Corn and sorghum gave similar results. However, corn at least is known to be susceptible to this disease (*vide* Nowell), so that in this district it would be advisable to cease growing this crop in the proximity of infected cane. The control of this disease is based on methods of prevention rather than cure, that is to say, on the planting only of healthy cane and the destruction of infected material. All plant and ratoon crops should be carefully gone over and all stools showing the disease should be dug out and burned—if the number of diseased stools makes this course impracticable the field must be ploughed out as soon after harvesting as possible. Cane to be used for planting purposes should be selected at least three months before the plants will be required, wherever this is feasible, so that the block can be carefully watched for the appearance of disease and diseased stools destroyed. Where a crop is ploughed out because of the abundance of this disease it should be fallowed for at least twelve months and rotated with leguminous crops. If all growers will co-operate in this fight against Leaf Stripe disease, the variety B. 147 will not need to be abandoned, but if co-operation is lacking control will not be effected.

The disease is especially prevalent in the cane lying within a radius of 2 miles from the town of Mossman, and in parts of the Saltwater district, but is scattered throughout; yet a few fields of B. 147 remain which are apparently not infected.

Leaf Scald.—Many of the fields lying in the western half of the Mossman district were found to be more or less peppered with stools afflicted with Leaf Scald. This applies more especially to the variety H.Q. 426, many stools of which showed the wilting stage of the disease and also to the variety N.G. 24 B (Green Goru). Some fields of Badila were also slightly infected.

Minor Diseases.—A species of Marasmius is doing very slight injury to young cane in these parts. Sclerotial disease is common enough and in some fields has reduced the number of sticks per stool by killing the tertiary shoots. True Rust is lightly distributed throughout the district.

Insect Pests.—On the whole insect pests have done but little damage in this district of late. Wire worms have been somewhat troublesome in young plant cane. The Frenchi grub has made itself felt in some localities, especially at Mowbray, by destroying or severely stunting patches of young plant or ratoon cane in some fields. The common Sugar-Aphis (Aphis sacchari) and the accompanying Sooty Fungus is to be seen here and there in certain fields.

Physiological Deformity.—Recently certain blocks of Badila and other canes in this district became affliated by a bunching up of the leaves which was mistaken by some to be a serious disease of a "mysterious" nature, but which proved to be nothing more serious than a common defect following a period of very good growing weather, the bunching up being due to the twisting of the innermost growing point of the cane when its growth is at all quicker than that of the surrounding tissues. The cane quickly recovers from this temporary check.

Cairns.

From the point of view of actual damage from cane diseases this district is in a sound position, but three very serious diseases occur here, which will prove a serious menace if not closely watched. These are Leaf Scald, Gumming, and Mosaic.

Leaf Scald.—A great deal of attention has been drawn to this disease in this district during the last couple of years, but, as some growers are still inclined to look on the matter lightly, it cannot be too strongly emphasised how serious this disease may become in the future. Although fields may be found here and there where H.Q. 426 and other varieties are being very severely damaged by the disease, Leaf Scald at present is not causing very serious losses to growers. The disease is at its worst in the Behana locality, and is fairly bad on the Upper Mulgrave and parts of the Freshwater district. Most of the farms in the Cairns district can show at least a few stools of Leaf Scald. The virulence of Leaf Scald disease is to a very large extent controlled by climatic factors, that is to say, that several years may go by before a really serious outbreak occurs. But growers may rest assured that unless very active steps be taken to reduce the incidence of the disease to an absolute minimum, great losses will later on be incurred in the more susceptible varieties, when seasons suitable to the spread and injury of Leaf Scald occur. The remarks made on the control of Leaf Stripe in the preceding Mossman report apply also to this disease, although it is not necessary that diseased stools be burnt, provided that their further growth is entirely prevented. The danger of knife infection is also an important factor in the control of Leaf Scald.

It is of interest to note that both in this and the Mossman district a bacterial disease very much resembling Leaf Scald was observed in blady grass, but is not by any means general in its occurrence. I am hoping to be able to carry out inoculation experiments with this disease on my next visit, in order to decide definitely whether or not it is Leaf Scald, as, if it is, this information would be of great value in disease control.

Gumming Disease.—Owing to the keen scientific interest which prompted one grower in the Mulgrave district to mention to me that he suspected the presence of Gumming disease in his H.Q. 426, I was able to locate this disease in two varieties on the farm, including the one already mentioned. The disease would appear to be confined to a small area, but, as this area is located in the heart of an important cane locality, there is grave danger of its spreading further by knife infection, by plants, by insects, and by the dropping of infected sticks from cane trains as they go through other fields, although every precaution will be taken by the grower concerned to prevent this. Thus all growers would be well advised to be on the lookout for this most important of diseases, bearing in mind the fate of the Herbert River fields of H.Q. 426 and of other varieties further south.

In order to prevent the spread of Gumming or of any other disease it is expedient that all canegrowers become acquainted with the symptoms of the disease. The presence of sticky substances on the outside of a cane stalk is not a sign of Gumming disease as some would believe; the gum, from which the disease derives

its name, is found in the inside of the stalk and not on the outside. A stick of cane which has for some time been infected with the disease on being cleanly cut through will soon produce small beads of yellow gummy substances which will ooze from some of the fibres of the cane, and in more advanced cases some of the fibres will be red in colour and will produce red gum. The gum is even more evident if a piece of the cane is kept in a closed "billy can" for some time, from five minutes to twenty-four hours according to the acuteness of the infection. Besides this symptom gumming disease also has its own peculiar leaf markings. These consist of rather long irregular longitudinal dead strips in the green of the leaf, running from the dead tip of the leaf towards the leaf base for some inches. At the termination of each strip is found a broken line of a rich yellow colour dotted here and there with dull red; this line continues towards the leaf base several inches. The dead strips are enclosed by a very irregular and narrow dull red margin which distinguishes them from similar Leaf Scald markings. The portion of the leaf found between these dead strips is of a perfectly normal green colour, which shows that the leaf is not dying from natural causes. On finding these symptoms in his cane the grower should make it his business to plough out the infected field at the earliest opportunity, and under no circumstances whatever should he use any of this field for planting purposes.

Mosaic Disease.—Four farms were encountered in the Cairns and Mulgrave districts which carried cane showing symptoms of Mosaic disease. On one farm at Highleigh, Mosaic was found in Badila, though the infection is very light indeed; on two farms at Aloomba the variety H. 109 showed mottled leaves, and on an adjoining farm one stool of H.Q. 426 was found infected. Several stools of an older and discarded variety were found on one farm in the Hambledon area which were similarly diseased. Thus the disease is present in this district and steps must be taken to prevent its spread. In the case of both of the gumming and Mosaic I am personally assisting the growers concerned in clearing their farms of disease, but this alone is not sufficient—all of the Cairns canegrowers must ever be on the *qui vive* lest these diseases should insidiously creep their way throughout the district. Now is the time to use the "ounce of prevention" and save the community from a certain loss of many thousands of pounds which must be suffered if these diseases get a hold of the Cairns acres.

Minor Diseases.—Sclerotial disease and Marasmius are proving somewhat injurious to crops in parts. Sclerotial disease is especially prevalent in the Mulgrave district.

30th March, 1925.

Babinda.

There are at least two diseases of importance showing up in this area at the present date; these are Mosaic disease and Leaf Scald disease.

Mosaic.—This disease was observed only in two small blocks of B. 208 and owing to the vigour acquired by the plant through growing in this tropical climate but little damage has so far been done. As in both cases the affected variety was surrounded by the very resistant cane Badila, there is at present no sign of the disease having spread to other fields. However, as a great proportion of the B. 208 growing in this district has originated from the same diseased stock, it would be well for growers intending to plant this variety to be well on the lookout for signs of the disease, and for those already growing the cane to rid themselves of it should any symptoms of the disease be showing.

These symptoms consist of "a general longitudinal streakiness of the green colour, caused by the paling of many small and ill-defined areas" (Nowell). These markings are most conspicuous on the inner leaves.

Leaf Scald.—During the course of the writer's visit thirty farms were visited, these being rather evenly distributed between Mount Sophia and the Bucklands and Bartle Frere Estates. Of these thirty farms 79·3 were infected with Leaf Scald the infection being greatest towards Cucania. Several farms were inspected where H.Q. 426 was receiving a severe check, especially in plant cane. In such cases many young stools could be seen wilting and drying up in spite of the wet weather. These stools invariably die and mean a loss in tonnage, and a loss through increased cultivation due to the growth of weeds, which invariably takes place in these vacant places. On being questioned about the source of the plants the grower calmly informs one that while cutting the plants dead sticks were seen here and there, but that these were put down to dry weather or senescence or Red Rot or any other plausible cause, but in spite of the amount of warning which has been given growers on the subject of Leaf Scald of late, very few growers as yet ever think of giving it a thought when they find dead sticks in their Clark's Seedling or other canes. There are other diseases which will cause the death of sticks in cane fields, but in districts north of the Herbert River Leaf Scald is the one which growers have

most to be concerned about. The presence of sickly yellow shoots at the base of the dead stick and of small dead shoots on the dead stem itself is generally sufficient indication of Leaf Scald in Clark's Seedling in the northern cane districts, and growers finding these signs in the cane they have chosen for plants should seek elsewhere for healthy stock and so avoid the risk of very heavy loss as has been suffered by some growers in this district this year. The writer would be pleased to answer inquiries in this matter and offer suggestions as to likely sources of healthy plants to growers desiring to improve their stock.

Having once introduced healthy stock into their farms every effort should be made by the growers to maintain a healthy supply of plants for future plantings. Cane to be used for plants should be selected when young in some part of the farm known to produce good cane, and fortnightly visits made so that every stool showing disease can be uprooted and carried off the plant plot. In this way the growers can keep their crops healthy and avoid loss in tonnage, in poor strikes, and in excess cultivation.

Minor Diseases.—These include fungus diseases of the roots and leaf sheaths. Those in the first group are best controlled by making the growing conditions of the plant as auspicious as possible—by improved cultivation and by addition to the soil of necessary but deficient ingredients. Of the diseases of the leaf sheath mention can be made of what is known as Sclerotial disease. Sclerotial disease is caused by parasitic fungus scientifically known as Sclerotium, which is very conspicuous where it occurs, and is undoubtedly already known to most growers though perhaps not by this name; the leaf sheaths of affected canes are found to be stuck together and to the stick, though not so firmly as is the case with some other diseases; on the outer surface of these leaf sheaths is found white and somewhat hairy threads of fungus which branch out and form stellate patterns. Attached to these fungus threads small pink club-like appendages are seen, which latter fall off, and, given sufficient moisture, germinate, and infect fresh stems. The affected leaf sheaths are found to have wholly or partly altered in colour from the natural green to a very bright salmon red which is especially marked on the under surface. If the leaf sheaths be pulled away a rather thick transparent gelatinous slime is found which later dries up and causes the leaf sheaths to cling together.

Although Sclerotial disease destroys a great many young shoots in an infected field, its damage is very seldom severe and consists mainly of a general stunting of affected parts of crop. Its presence in a field is a sign of excessive moisture, and often lack of ventilation due to heavy growth of weeds on headlands, and sometimes in field itself, too close planting, &c. It has been stated that affected cane is of a lower density than healthy cane. Where the disease occurs, especially in cane which is to be kept for plants, stripping should be practised, as it has usually been found that the increase in tonnage more than pays for the work, and at all events a healthier and more vigorous stand of cane is obtained.

Insect Pests.

Grubs.—Judging by the general appearance of crops, it would appear that although no great area of cane is likely to be destroyed by grubs this year, yet the damage to be anticipated is a good deal greater than that of last year. Already, owing to the recent heavy winds, one or two fields are well down and yellowing. The damage will probably be at its worst on the northern end of the district and several fields between Babinda and McDonnel's Creek, in spite of the plentiful rains, show the erect inwardly curled leaves indicative of a damaged rooting system. The grub in question is, needless to say, the grey-back. On all of these farms where grubs promise to be injurious it is a noticeable fact that the soil is invariably suited for fumigation, and I would recommend that a series of field experiments be instituted here by the Bureau in order to demonstrate to the affected growers the great value of this form of control. Most of the grubs are now in their first stage, so it is of course too late to do any fumigation here this year.

The *frenchi* grub has also been responsible for a certain amount of damage earlier in the year, but only to a very small extent.

Other grubs met with during the course of the visit include *L. caudata*, *D. australis*.

Other Insect Pests.

The Borer Beetle will probably do slightly more damage this year than last, but is not likely to again become very serious as the Tachinid fly parasite is, and for some time has been, well established. However, it can be expected that in this great fight for supremacy between borer and fly decisive victory will never really be attained by either side, the advantage going first to one and then to the other, so

that results will be periodic in nature following, probably, the cycle of seasons. This, of course, does not detract in any way from the great value of the parasite, which annually destroys many hundreds of thousands of borers that would otherwise reach maturity and by laying their eggs multiply themselves manifold, to the great discomfiture of the grower. The small white ant or termite has been responsible for slight damage in parts, but not to an extent which would warrant the adoption of active control measures.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Fungus and Bacterial Diseases of Grubs.

Be on the watch for grubs killed by the Green Muscardine Fungus (*Metarrhizium anisopliæ*), which is usually in evidence from March to May, or June. When attacked by this vegetable parasite the body of the grub, instead of decomposing, retains its original shape and, gradually hardening, turns at first white and then an olive-green colour.

At this stage, being filled with the fungus roots or mycelium, these grubs become mummified and can be broken into pieces as though formed of dry cheese. The sphere of usefulness of this parasite could be much extended if farmers would collect all such green crusted-looking grubs, break them into small pieces, and thoroughly mix same with about 100 times the quantity of moist, finely, sifted soil, rich in organic matter. This spore-laden earth should then be sprinkled or sown as thinly as possible in the furrows when planting any areas thought likely to become grub-infested.

Keep an eye open also for dead or dying grubs exhibiting black blotches on the sides or legs. These will probably be affected by bacterial diseases, but, unlike the preceding, instead of hardening remain quite flaccid and soon decompose to a black putrid mass.

Growers finding evidence of such disease are urged to communicate with the Entomologist at Meringa.

Collecting Cane-Grubs.

During ploughing operations collect the grubs when plentiful. Those of the grey-back cockchafer will be mostly in the third stage (width of head, $\frac{5}{8}$ in.), while grubs of *frenchi*—the small, brown cane-beetle, that was flying so commonly last December—are mostly in the second instar. All specimens, however, should be picked up, as grubs of the latter insect will damage cane during September to December next. It is well to remember that this common-sense method of control is recognised and practised as a matter of course in other sugar-growing countries.

The value of dried cane-grubs as a fertiliser is about £11 per ton, and higher than that quoted for European cockchafer. Such manure contains 10.20 per cent. nitrogen, 1.66 phosphoric acid, 1.73 potash, 0.27 lime, 63.75 proteins, and 4.82 fat. There is a market in Sydney for dried grubs, which are a valuable poultry food.

The Best Way to Combat Weevil-Borer.

Watch the growth of cane on river flats, and examine stand-over crops at intervals, and if discovering evidence of this pest having commenced attack on the basal portion of canes, make the matter known to the Entomologist without delay.

Tachinid fly parasites will be released by the Sugar Bureau free of cost on areas affected by this formidable insect, on condition that the farmer will agree to leave at least one quarter of an acre of grub-infested cane uncut for these parasites to breed in. This area should be left standing for fully three months, and must not be burnt.

Protect Your Beneficial Insects.

Do not destroy soil-frequenting larvæ, &c., of insect friends, which are parasitic or predaceous on grubs that injure your cane.

Some of the commonest of these were figured in last months Entomological Hints (see "Australian Sugar Journal," and "Queensland Agricultural Journal").

Combating Moth-Borers.

Caterpillars of the large Moth-Borer (*Phragmatiphila truncata* Walk.) are at present more or less in evidence at Mount Pelion, near Mackay, and possibly in the Burdekin area, destroying shoots of young ratoon and plant cane. Growers would do well to cut out diseased shoots showing "dead hearts" at about a couple of inches below ground level, and either crush or burn same to kill the caterpillars or pupæ of this moth. If this were done at the commencement of the season most of the moths responsible for the second and much larger brood of caterpillars would be destroyed. In the case of severe infestation any parasites present should be allowed to escape from diseased shoots, in the manner already described in previous Hints (see "Australian Sugar Journal," Vol. XVI., p. 247, 1924).

When occurring in the tops of mature canes the central leaves are often killed, and when attracting attention are sometimes mistaken for evidence of fungus attack. Upon cutting through such affected cane tops, however, one finds tunnels containing excreta, &c., which if opened up will be found to harbour a smooth, pinkish-yellow caterpillar about an inch long, which, when exposed to the light, wriggles vigorously and tries to fall to the ground.

The basal and central portions of cane sticks are also frequently tunnelled by this borer, such injury, however, usually remaining unnoticed unless severe enough to bring about discolouration of the heart-leaves.

When about 10 per cent. of stools are affected, all tops with dead-hearts should be cut off just below the injury, and either crushed or burnt.

PLATE 68.—CANE-GRUBS, DESTROYED BY "GREEN MUSCARDINE FUNGUS."

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (18th February, 1925):—

Maryborough.

The cane in this district is growing strongly. The ratoons, in some cases are not as forward as could be, consequent in some instances to poor ratooning following late cutting.

Cane varieties observed growing included E.K. 1, C.S.R. 3, N.G. 22, Black Innis, B. 208, H.Q. 285, Petit Senneville, N.G. 81, Q. 813, E.K. 28, M. 1900 Seedling, D. 1135, Q. 970, H. 227, Q. 1098, M. 189, E.K. 2, Badila, Rappoe, Meerah, and Striped Singapore.

Mosiac disease was identified and pointed out to the growers, also the disease known as "leaf scald." Only two affected stools were found.

Insect pests are doing very little damage. Various sap-sucking insects are plentiful that are doing very little damage. As a media of infection, however, the cane leaf-hopper (*Tettigonia*) in relation to bacterial diseases is always likely to be an enemy to the growers. An attack of fungus is often induced by the presence of aphides. It may be assumed from this then that the canes with free light trash are, if possible, the best to grow, on account of the minimum of harbourage they give to these parasites.

Pialba.

Growers are busy checking a heavy weed growth.

The cane is growing strongly. Growers are using more fertilisers than hitherto. Analysis of typical soils show that the following, per acre, would be a useful mixture to try:—200 lb. sulphate of ammonia, 100 lb. sulphate of potash, 200 lb. meatworks.

The only infection causing any loss is Mosiac, and the word "loss" could hardly be applied to the very small amount showing.

Insect parasites, and the damage incident to their presence were hardly apparent, excepting, perhaps, the black beetle (*Pentodon Australis*). The slight destruction caused by this insect was noticeable on the headland in the vicinity of paspalum grass, the natural habitat of this insect.

Varieties looking best are those referred to in previous reports, notably Q. 813, H.Q. 285, and M. 1900 Seedling. One grower is trying to carry out that most useful operation, the working in of the trash. Some growers think that trash harbours injurious insects, but entomologists assure us there is no foundation for this supposition.

Effective drainage is a matter to which the Pialba growers require to give a little attention. The farms on the whole are naturaly drained, still there are patches on a great many that are badly drained, and until the surplus moisture is taken from these neither lime nor vegetable nor chemical manures will give results.

These badly-drained pockets cannot be classed among the partially sterile such as occur in the red soils, they are simply unfertile for lack of drainage.

Mount Bauple.

The cane looks well, although ratoons are backward. Varieties grown as staple canes by the farmers look well, and of the untried canes the most outstanding is H. 227. This is a variety that has not so far had a fair test from the farmers. In addition to being a hardy, vigorous cane, it is very resistant to injury by disease, although not immune.

Mechanical tractors for farm work are gradually coming into use, and the growers are making more use of fertilisers, and in some instances, lime. On some of the lower lying soils the writer is of the opinion the growers should make greater use of lime and green manures. In the soils referred to, the cane is not germinating as well as it should and the cause is not to be found in inferior plants or poor soil. The explanation is then that the texture of soil wants improving so that the covering does not cake and the plant falls into a spongy bed of soil that will not become unduly hard after a week or so from the period of planting. If plants are good and the physical condition of the soil is well improved, a minimum of misses may be expected by the growers.

A comparatively new area—Beaumont—is being farmed. This is practically all scrub land.

In all the areas visited the growers of cane are taking an exceptionally keen interest in the industry and are aiming at a high point of efficiency. After all, there is no reason why Queensland should not reach a high standard in cane sugar production, for here all scientific investigation has the assistance and sympathy of a large body of intelligent working farmers who try experiments and work out problems that in countries where coloured labour is employed are often left to uninterested workmen or overseers to carry out.

The Northern Field Assistant (Mr. E. H. Osborn), reports to the Director (Mr. H. T. Easterby), 26th February, 1925:—

Herbert River Area.

Ingham rainfall for 1924 amounted to 65.50 in., whilst 56.77 in. represented the Halifax fall. Roughly, these figures are some 15 in. below the average. The district as a whole has progressed very rapidly, especially during the past few years. The town of Ingham is spreading out to a marked extent, and many new and substantial buildings are in course of erection. The Shire Council are gradually improving the roads, whilst the Main Roads Board are likewise very busy upon the Ingham-Halifax section. Victoria crushed 164,600 tons, also 5,622 tons of Macknade cane. Macknade accounted for 174,831 tons, besides sending 5,622 to Victoria Mill. These totals illustrate the progress of the industry when one recalls the figures of former years. Each of the mills claims a highly successful run, no industrial troubles causing lost time. Extensive additions are being made to each factory to handle the huge crop that is anticipated for 1925. The season's prospects are very good, for the crops everywhere look splendid and the growing conditions ideal, also the acreage under crop is very large.

Cane Varieties.—The principal are Badila, H.Q. 409, Goru (N.G. 24, N.G. 24 A, N.G. 24 B), Q. 813, Orambo, Nanemo, and Korpi. Owing to gum, H.G. 426 (plant) is barred, but there is a fair quantity of ratoons of this variety still growing. Badila is, of course, the principal cane grown upon the better soils, and some splendid crops were seen. H.Q. 409 for a medium soil is steadily increasing in favour, but is rather a tricky cane, requiring to be planted either very early or after the cold period. Its ratooning qualities are also said to depend largely upon the time of cutting. As a rule it is not advisable to put too much covering upon the sets, and the same may be placed well apart, for it is claimed to be a heavy ratooner. As for the Gorus, very good returns are also being got upon suitable ground.

Korpi, Nanemo, and Orambo are also being grown throughout the area, and of these many farmers seem to favour the latter, saying that it strikes and ratoons well and only arrows slightly, whilst it does not shoot at the sides as much as the former two.

Q. 813 still continues to give very good results, and it is surprising to see how many growers have small areas. Many enquiries were made for E.K. 28 whilst in the area. Upon Mr. L. Roarti's farm, Macknade, some splendid first ratoons, E.K. 1, Q. 855, and Q. 813, were noticed, while a few small patches of M. 1900 were seen in a couple of places.

Diseases.—Top Rot in Badila was noticed in several fairly isolated parts, but was generally seen only in single stalks. Although Gum and Scald are about, the symptoms of same were not showing up to any marked extent then.

Liming and Green Manuring.—Although there is a fair amount of this very necessary work being carried out, there is still a vast amount of room for improvement. This also applies to the ploughing in of trash.

Messrs. Biggs Bros., of Halifax, have used in successive years 80, 90, and 105 tons of earth lime, and plough in their trash. They claim that paddocks, originally hard put to to cut 20 tons per acre as a plant crop, gave a yield of 39½ tons per acre last season, while the volunteered ratoons (non-manured) look good enough for another very heavy crop.

Fertilisers.—Many brands are used in large quantities and certainly justify their application. In general it can be safely said that the standard of cultivation has greatly improved during the past few years, probably due to the fact that the ordinary Italian grower never seems to be short of a number of casual fellow countrymen workers, when such are required, whilst a Britisher may have difficulty in obtaining same. It would be curious to know what wages the non-British workman receive when employed by fellow-countrymen, and the situation calls for inquiry.

Innisfail (Goondi).

Goondi mill finished a record crushing of 165,900 tons, after a very successful run, no time being lost through industrial disputes.

Some magnificent crops of cane were harvested, in fact the whole area cut at the rate of 23½ tons per acre, whilst Daradgee, in accounting for nearly one-half of the crop, averaged over 27 tons per acre for all classes of cane. As a large portion of the Goondi area has been under cane for very many years, the averages are very fine, and emphasises the wonderful fertility of this rich sugar district. Owing to continuous rain after cutting ceased, cultivation work was much hampered, but

despite this the cane was making very heavy growth, the ratoons having stooled out splendidly and carrying a very healthy top. The weather conditions were also ideal for great growth, *i.e.*, light showers accompanied by excessive heat.

Varieties.—The principal canes grown in the area are Badila and Pompey (7 R. 428), the company advocating the latter for land that will not grow Badila, but advise farmers to try to improve their soil conditions enough to grow the former variety.

During the past seasons some very good crops of 7 R. 428 were cut, the ratoons of same now looking well.

Several small plots of E.K. 28 were seen and a few acres of plant H.Q. 458, showing splendid growth, were seen upon the Upper Daradgee area.

Green Manuring.—Green manuring is probably carried out in the area to as large an extent as in any other sugar district, and quite a large number of growers are ploughing in trash; as for liming, it has so far been so expensive an item that its use has been nearly prohibitive. With the railway right through now, lime from the Reid River or Chillagoe should be more easily obtained.

Fertilisers.—Very large quantities are used here, but, as mentioned very many times, are not able to give their best results unless the land previously is in proper order.

In connection with this many growers have sent soil samples to the Agricultural Department in Brisbane quite lately, and the work of the Sugar Experiment Stations seems to be more appreciated and more studied than formerly.

Diseases.—Leaf Scald seems to be far more in evidence than previously, Badila showing it in widely scattered areas, probably owing to the fact that the disease is more marked when the cane is making heavy growth. At present Mr. Trivett (Pathologist) is stationed at Goondi, and is giving the growers much valuable advice on diseases and cultivation.

Tully River and Ban Yan.

One hundred and sixty-eight inches of rain fell during 1924 and 17 inches for January, represented by 165 wet days.

Good headway has been made with the mill tramways, and plate laying had just been started, about 15 odd miles of formation and bridges being ready for the rails.

Outside many new growers are establishing themselves on the lands adjacent to the Tully, and some very fine Badila, plant and young ratoons, was noticed. Here also the wet weather had hampered cultivation work. Nearer the township one or two plots of yellowish (stiff) soil showed a rather indifferent and very patchy growth of cane. Probably a dressing of at least 1 ton, but preferably 2 tons, of crushed limestone per acre would sweeten up this land, for the soil reaction here is very acid.

Diseases.—Leaf scald was noticed to some extent in neglected old Badila ratoons, in some fifteen months' old plant, and in some young ratoons, all upon the same farm, while an adjacent farm that had obtained plants from here also showed it in a small block of about eight weeks old plant cane.

Growers are earnestly advised to be very careful with their seed selections, using none but the healthiest cane, discarding any that shows any suspicious white markings on the leaves, or with the tips withered and more especially with the top edges of the stalks shooting, such shoots showing thin white lines.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 21st April, 1925:—

Gin Gin.

There has been no lack of rain this season, but in these high red soils that supply the bulk of Gin Gin crops it would be almost impossible to get too much rain. Surplus moisture drains very rapidly from this class of land. Where the growers do suffer here, however, is in cases of heavy thunderstorms, when, by washing, a considerable amount of soil is deposited in the depressions. However, very little of this has occurred this season, as the rain has been mostly of a steady nature.

The staple canes M. 1900 Seedling, D. 1135, Black Innis, and Q. 813 are giving satisfaction. Farmers are recommended to do more experimenting than they are doing with cane varieties. This at the present time is a most important matter. Care should be taken of the plot, the canes identified with their distinctive numbers

at the end of the rows, and diseased ones weeded out. Some growers contend that we shall never produce higher density canes than at present, but this is a dogmatic statement which cannot be disproved effectively unless growers co-operate in the work of experimentation. The writer is of the opinion that with careful and systematic research in respect to high c.c.s. canes, and greater activity with regard to increasing the humus content of the soil, we shall produce canes of a higher density than are at present being produced in the Southern districts. From experience generally in Queensland the writer has observed that the soils rich in vegetable matter invariably, if properly farmed, produce higher density canes than those which are deficient in humus.

Farmers are not troubled much with insect parasites. Mosaic disease is causing loss, however, especially in the M. 1900 Seedling, but if growers take care in plant selection in the future they will gradually stamp out this disease. If they do not, in a few years' time it will probably have a serious hold on this Mauritius Seedling.

Maroondan.

The growers here are satisfied with their outlook for the coming season as far as this crop is concerned, although like the cane farmers in other districts they regard the general economic outlook with some concern. The high cost of production is always a bugbear to the farmers, but the canegrowers should remember that they can do a little themselves towards lowering the cost of production. Take two items, plants and fertilizers. Putting the matter briefly how much valuable time and labour is absorbed in supplying misses? It is not always due to bad sets, but very often it is so. And how many growers buy fertilizers that "refuse to act," when a little local experiment would give the farmer exact information?

Maroondan growers are taking a very keen interest in cane diseases. A well-attended meeting was held at the local school during the writer's visit, when a useful discussion on cane matters, generally, took place.

Cane varieties doing well here are M. 1900, Q. 813, H.Q. 285, and D. 1135. E.K. 1 is making good growth but is suffering considerably from the attack of a parasite causing a red rot at the base of the stick.

"Leaf Stripe" disease is rather serious here, especially in the Striped Singapore. The growers are recommended to get rid of affected stools by burning as quickly as possible where this disease occurs. Where "Leaf Stripe" is bad, the downy mildew almost covers the underneath of the leaf and is easily recognised. Where a fungoid such as this attacks the leaf the sugar content of the cane would no doubt suffer considerably.

Bullyard.

Several growers were visited in this locality and it was pleasing to note that the cane generally looked healthy and well cultivated. Varieties making good growth are Q. 1098, Malagache, Q. 813, E.K. 1, M. 1900 Seedling, and D. 1135. The farms are mostly level and accessible to the plough, therefore if growers here keep their fields healthy and do not allow their varieties to deteriorate they should be able to carry on as well as any other cane-growing area. The Bullyard farm lands are well served with a substantial tram line built by Bingera, and although it may not carry quite as much cane as last year there is every indication that the crop will be a good one.

Cane diseases showing here in a minor way are Mosaic and "gumming," the latter in the D. 1135 and the former mostly in the M. 1900 Seedling.

Avondale.

The cane on the Kolan River in this locality is making strong growth, particularly the variety Q. 813. This cane appears to be adapted for growing in alluvial soils which are fairly rich in humus more so than in the higher volcanic areas. Other canes doing well on the river are H.Q. 285 and D. 1135.

There is no fresh disease development to comment upon since last visiting this area.

In the Bundaberg district the attention of the growers is directed to improvement of the partially sterile pockets that occur in the red soils. Cane-growing in these pockets is generally weak and attacked by "foot rot" or "root rot" disease. It appears to be caused by the fungus Marasmius Sacchari. The Marasmius mycelium can be seen covering the base of the shoots in nearly all cases. It is rather difficult to say for a certainty what causes "foot rot," but these pockets as they are, are a menace, and growers, to keep this disease from spreading, should strengthen these soils and produce in the canes growing on them a greater degree of resistance.

WINTER GREEN FODDER AND CUCUMBERS IN THE NORTH.

FERTILISER TRIALS.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, recently supplied the Department of Agriculture with the results of winter green fodder and cucumber fertiliser trials carried out at Evelyn, Ravenshoe, and Bowen, respectively. These have now been put in tabulated form for purposes of comparison under different conditions of soil and climate.

Mr. Pollock's notes on the conduct of these wheats under varying conditions are appended.

With one exception these wheats are of Queensland origin.

NORTHERN EXPERIMENTS, 1924.

Winter Green Feeds.

Farm: S. E. Thomas, Evelyn. Scrub soil, sown 5th May, 1924; estimated 6th September, 1924:—

	Tons.	cwt.	qr.	lb.
Wheat—				
Gem	7	17	2	0
Bunge	6	5	1	12
Watchman	6	11	3	4
Three Seas	5	19	3	8
Warrior	6	11	3	4
Florence	7	17	2	0
Warrior and Vetches	6	18	0	24
Peas—				
Grey Field	16	11	0	0

These wheats were sown on land that had been under paspalum pasture for some ten years and made a very good growth, though slightly uneven in parts due to the ploughing. When estimated the crops were somewhat on the mature side and would have weighed heavier if cut a fortnight earlier.

It is apparent when compared with McKay's plots on comparatively new soil that the crop on the old land will come to maturity sooner than on new land.

The yield of Grey Peas was exceptionally good, the pods being well filled while flowering was still going on.

Florence is again to the front, being equalled by Gem, a nearly solid strawed wheat, which has done well in previous trials and is to be commended for tableland planting.

Farm: W. G. McKay, Ravenshoe. Scrub soil, sown 15th May, 1924; estimated 4th September, 1924:—

	Tons.	cwt.	qr.	lb.
Wheat—				
Watchman	7	7	3	12
Warrior	7	9	1	24
Florence	9	3	0	24
Warrior and Vetches	7	17	2	0
Warrior and Field Peas	7	1	1	20
Peas—				
Grey Field	9	17	2	0

The yields must be considered as very fine, especially when most of the flag has been eaten by caterpillars. Florence again demonstrates its superiority, and though it had an advantage in being at its heaviest state with grain just set, while Warrior and Soutter's Early x Warren had hardly finished flowering, it is not thought that these latter could at any stage have weighed as well.

The grey field peas in combination with Warrior and alone, were in full flower with the first pods just setting. Vetches with Warrior wheat were backward and had not made much growth; this legume would do better with a wheat of longer season.

Farm: V. Boulter, Bowen. Sown 20th May, 1924; estimated 8th September, 1924:—

	Tons.	cwt.	qr.	lb.
Wheat—				
Watchman	4	0	1	12
Three Seas	3	10	2	24
Florence	3	1	0	8
Warrior	3	4	1	4
Florence and Peas	3	12	3	20
Warrior and Vetches	3	1	0	8
Golden Vetches	4	0	1	12

The plots were on black alluvial loam on the delta of the Don River. Owing to insufficient moisture, fuel germination was delayed until early June, after which growth was excellent. Heavy rain when the crop was almost ready delayed harvesting, while the crop became badly affected with rust. Estimates were made when the crops were a little on the mature side.

The plots were most successful in demonstrating the growth of green feed in winter in Bowen district, where if rain does not come irrigation can be applied.

Cucumbers—Fertiliser Mixtures in Comparative Trials.

Farm: Mr. T. Moller, Bowen. Area, 1 acre in 10 plots, each acre.

FERTILISERS AT 200 LB. PER ACRE.

——	Super-phosphate.	Sulphate of Potash.	Sulphate of Ammonia.	Lime.	P.	K.	N.
					Per cent.	Per cent.	
Plot 1	120	30	50	..	10·2	7·8	5
„ 2	120	10	50	20	10·2	2·6	5
„ 3	60	20	50	70	5·1	5·2	5
„ 4	110	30	60	..	9·3	7·8	6
„ 5	..	Control	No manure	..	..	..	..
„ 6	80	30	70	20	6·8	7·8	7
„ 7	80	20	100	..	6·8	5·2	10
„ 8	100	10	70	20	8·5	2·6	7
„ 9	100	20	80	..	8·5	5·2	8
„ 10	..	Control	No manure	..	..	..	..

In order to test the application of fertiliser in the drill as against broadcasting, each plot consisted of two rows of plants; on the first row the fertiliser was applied in a shallow furrow between the irrigation furrow and the row of plants; on the second row the fertiliser was broadcasted over a strip 3 ft. wide, the length of the row, in the centre of which the seeds were planted after the fertiliser had been worked in with the cultivator.

Worked out to acre yields the results for each system calculated in bushels were:—

——	Fertility in Drill.	Fertility in Broadcasting.	Increase by Broadcasting.
Plot 1	175	207½	32½
„ 2	177½	210	32½
„ 3	172½	175	2½
„ 4	160	172½	12½
„ 5	167½ Control	172½ Control	Difference of 5 in controls
„ 6	172½	180	7½
„ 7	132½	200	17½
„ 8	180	182½	2½
„ 9	155	155	nil

No. 9 plot was low in parts which suffered from too much water when irrigated.

While there might be a little inequality in the soil on one plot, as in Plot 5 where a difference of 5 tons to the acre occurs without fertiliser, the increase in every plot where the fertiliser was broadcasted points emphatically to that system being superior to the general practice of applying in a shallow trench next to the water furrow and allowing the water to carry the fertilising element to the plants.

Taking the yields of plots where the fertiliser was broadcasted, excluding No. 9, the results calculated to 1 acre are:—

	Bushels per Acre.	Increase due to Fertiliser.
Plot 1	207½	35
Plot 2	210	37½
Plot 3	175	2½
Plot 4	172½	0
Plot 5	172½ Control	Control
Plot 6	180	7½
Plot 7	200	27½
Plot 8	182½	10

It will be seen that mixtures in Plots 1, 2, and 7 give higher yields.

The object of the fertiliser trials was not only to secure data as to yield, but of the influence, if any, of the fertilisers in improving the colour of the fruit, which ordinarily takes on a pronounced yellow tinge in transit to market.

Six fruit from each plot were taken to Townsville and kept for a week, when it was found that the fruit from 6, 8, 9, and 4 were almost equal in keeping the green colour, the remainder being placed in order in respect to their retention of the green colour are 3, 7, 1, 2, 5, the last and worst being the control plot with no fertiliser.

During growth there was a marked difference in all fertilised plots over the control plot (without fertilisers), Plot 8 showing the most growth, closely followed by Plots 2 and 3, while 1, 4, 5, 6, 7, 9 were similar and No. 5 the worst.

On all fertilised plots the quality of fruit was superior to the control plot, being better in shape and colour, the unmarketable fruit being less than one in a hundred. On the unfertilised plot the colour was not good and proportion of ill-shaped fruit much greater.

The conclusions to be drawn are that the use of fertilisers improves yield and quality, and that its application broadcast and worked into soil prior to planting the seed is preferable to applying in a drill.

The increase in yields in Plots 1, 2, and 7 when compared with the composition of the fertiliser mixtures applied, does not give an indication as to which mixture could be calculated to produce the best results, since in each mixture the percentages vary. Further trials will be made next season, when comparisons with this year's results may be more illuminating.

It may be pointed out that No. 1 mixture could be most easily prepared by farmers by adding 10 lb. of sulphate of ammonia to each 100 lb. of No. 5 superphosphate.

A trial of similar nature to that on Mr. T. Moller's farm was undertaken on Mr. C. E. Jones's farm, Euri Creek, but owing to the plants being blighted the trials were without tangible results.

FROM SAVAGERY TO SILVICULTURE.

BY E. H. F. SWAIN, Chairman of the Provisional Forestry Board.*

Two thousand years ago, the savage having made an axe, besought the forest to supply the handle. The forest in its innocence having furnished one, has been the subject of the axeman's attention ever since. So runs an old Eastern fable.

Two thousand years ago the whole world was sylvan. The great out of doors was the forest, and this indeed was the first meaning of the word.

And man belonged to the forest or sylva, and was called therefore the sylvager, or man of the woods—in other words, the savage; and thus the derivation which relates the savage who crept through the primeval forests in search of shelter, food, fire, and weapons, to the silviculturist who to-day seeks to preserve what is left of that which generation after generation has carelessly used and ceaselessly destroyed.

Two thousand years ago, from Alsatia to Switzerland and to Transylvania, the traveller might march for sixty days through "one vast wilderness, an endless continuity of shade." All Europe was possessed by trees. Denmark was the "horrida sylvis." Britain was a woodland. An English township, as Cæsar found it, was "nothing more than a thick wood fortified with a ditch and a rampart." The Druids practised their rites in dark groves and secret recesses of the oaklands, at their principal seat in the shady Island of Anglesea. The Saxons chased the wild boar and deer through the English forests and the Saxon noble built his "wooden halls in the woodlands, where, with his hillmen and bowmen, his hunters and his born-thralls, he grossly lived and lustily hunted the abounding game." The clergy erected their religious houses "amid shady woods and by silvery rivers," and claimed title in Norman times to a third of the countryside.

In the reign of Henry II., London itself was ringed with trees "in the covers whereof lurked bucks and does, wild boars and bulls," and a State Forest as defined by law in 1589 by Manwood was no less than:—

> "A certen territorie of wooddy grounds and fruitful pastures, privileged for wild beasts and foules of forest, chase and warren, to rest and abide in, in the safe protection of the king for his princely delight and pleasure. And also replenished with wild beasts of venarie or chase and with great covets of vert for the succor of the said wild beasts to have their abode in."

The prime purpose of the forests was the king's delight, and the forest laws were still severe against common trespass. State Forests were not held in any higher esteem by the people of 1589 than they are held to-day!

Meantime, in the New World across the Atlantic, extensive primeval forests slumbered undiscovered and undisturbed.

But in the East, man had laid low the trees, and Egypt, Syria, and Persia, sometime "lands made gracious with streams" were by now treeless and arid deserts, so that Pythagoras "need no longer forbid his scholars to live upon the beans, because the land was no longer capable of producing them."

> "The wine of Mendes and Mareotis which inspired the guests of Cleopatra—which was celebrated even by Horace—it grows no more. No assassin now finds the holy pine grove of Poseidon in which to hide and lie in ambush for the singers hastening to the feast. The pine has long since retired from the invading desert climate to the heights of the Arcadian Mountains. Where are the pastures now, where are the fields around the holy citadel of Dardanus, which at the foot of the richly watered Ida supported three thousand mares?"

The fertility of the soil had vanished with the forests that once shaded them. The glories of Lebanon had departed—"the goodly cedars with their tops among the thick boughs, their long branches, and their shadowy shrouds."

The English forests, the resort of hunters and outlaws, of Robin Hood himself, have since been scattered; Cumberland is desolate; there is scarce a grove in Lancashire; and Yorkshire is a manufactory. In Scotland, black moors replace the pine lands and barren heaths succeed the tall trees. Of the forests which adorned Caledonia, most are now merely names upon a map.

And yet again, the colossal pineries of Canada and United States of America are being swept before the advance of man. In the United States of America, not the savage, not the hunter, and not the invading army, but 45,000 great modern

*An Address delivered under the auspices of the Queensland Forestry Association at Brisbane, 19th March, 1925.

sawmills are devouring the woodlands at the rate of 5,000,000 acres a year, and 56,000,000,000 superficial feet of logs are being swallowed annually in a Gargantuan lumbering repast. Of an incredible forest estate of 822,000,000 acres, 685,000,000 acres have been logged, 80,000,000 acres so completely devastated as to become waste land, useless for any purpose at all. Half the resources in timber is gone, and the rest will be disposed of by 1950 or thereabouts.

Vanishing Assets.

In Canada there were 440,000,000,000 feet of pine saw logs standing and these will be used up by 1960, if the present rate of consumption continues; whilst the pulpwood resources are being digested at the rate of 7,000,000 cords a year in order that men may read the morning newspaper at the breakfast table and that woman may have her tortoise-shell comb.

In Australia, there is a sufficiency of our famous Eucalyptian hardwoods for present requirements, and there are grounds for belief that by conservation measures their reproduction and continuity may be assured. But in softwoods, an indispensable need, we are dangerously short, importing already 66 superficial feet per capita per annum from these very countries which are using up their resources at so alarming a rate.

Forestry in Queensland.

Queensland is fortunate among the Australian States, in possessing some home supplies in softwoods. There was a time, in fact, when Queensland had a surplus for export. But of Queensland's original 4,000,000,000 feet of standing pine, 3,000,000,000 have already been converted into houses, and at the rate of consumption of 98 superficial feet per capita per annum, with a 2 per cent. increase in population to be expected, only ten or fifteen years' life remains to the sawmilling industry of the State.

The plywood trade of Queensland, established only a few years, has only a few years to live so far as pine and maple are concerned, and these will both have gone the way of Red Cedar by the year 1935.

By dint of rationing, by dint of dilution with hardwoods, by the greater utilisation of the at present despised secondary woods, and by resort to increasing importations from the United States of America, Canada, and the Baltic, Queensland will probably be able to carry on for the next thirty years, with, however, a continually declining consumption and a continuous increase in price.

But ere thirty years elapse, the countries from which we import will be in straits similar to our own. In twice that time it may be taken for granted that the world will have used up all its natural softwood forests, even to those yet unknown quantities said to exist, in Siberia on the one hand, and in the tropics on the other.

The End in Sight.

Thus comes to an end the original gift of Nature to man in wood. *In sixty years from to-day the work of two thousand years of forest demolition by the human race will have been rendered complete, and the resource upon which civilisation has been nurtured from savagery for twenty centuries, will have ceased to exist.*

This to me appears to be one of the most momentous economic facts of modern times. Hereafter, man must rely upon his own endeavour to supply him with the timber he needs.

Man, of course, can do without timber, as he can do without wool, or wheat, or milk, or flesh—there are substitutes for all these things—but it is convenient to have the luxuries to which one is accustomed, and one need not doubt that man will be impelled, in the future, to exert himself to grow wood crops as he does farm truck, and to garden the forest lands as he does the fields in order to produce a harvest of logs for the expectant sawmills.

It is being done already elsewhere. In measure it has been done for 400 years in Europe. The Baltic timber now coming into Australia was grown by man. Denmark originally was a land of beech and oak trees, and these primeval forests have been converted into pineries. Germany and France have grown and harvested tree crops with rotations of 200 years.

There are in Queensland 4,000,000 acres of land reserved for forestry purposes. Much of it is mountain range and sand barren, of little value either for agricultural or silvicultural settlement. A little of it is good forest plantation soil, much desired

also by the private farmer. The natural vegetation of our jungles is primeval, a mixture of prime species in a wilderness of many trees; a scant commercial stand, congested, and showing little growth, extraordinarily deficient in the junior age classes, a forest at sight of which Lord Novar exclaimed "A silvicultural slum."

Utilitarianism—Will Nature take Revenge?

The age is one of grim utilitarianism. The barbaric charm of unordered Nature appeals not to our civilisation, and the fantastic variety of the Queensland wildwood must yield to the prim monotony of the regularly spaced and densely grown plantation forest, which amasses a maximum production of serviceable wood in a minimum period of time.

Nature, however, may demand its revenge. In the natural forest associations there is a biotic equilibrium which may be lacking in the artificial forests of man's creation. In Germany, the home of regimentation, the planted forests were regimented in pure even-aged stands of chosen species which produced 50,000 to 100,000 superficial feet per acre in 100 years, yielding 5½ per cent. compound interest upon the plantation investment, or 20s. per acre per annum. But the biophysical factors were thrown out of gear, and when the horse had been trained down to a single straw per day, it spoiled the whole experiment by dying. The primeval beech and oak forests had enriched the chemically poor sand-stones and conglomerates and the pure even-aged stands of spruce grew famously upon the savings of the original despised wildwood, but in the end, "the soil deteriorated, bacterial life and activity declined, the soil changed colour, and became covered with peat and moss which prevented moisture entering the soil and reproduction from developing," the rich fauna of phytophagous insects, their predators and parasites were driven out, the balance of Nature was overthrown, insect devastations swept the plantations, butt rot developed in the trees, and German foresters were brought to realise that over-artificialisation of the forests, particularly upon second-rate soils, was dangerous forestry procedure. They are now returning, sadder and wiser foresters, to mixed uneven-aged stands and are content to compromise with natural regeneration.

Even the forester must be respectful to Nature and a proper ecological arrangement must be maintained, by suitable intermixture of species and age classes, and a balanced composition of the whole forest.

Queensland's Forest Future.

In Queensland, one dare not grow Red Cedar in the open. It must be hidden singly amongst a crowd of other trees out of sight of *Hybsiphyla robusta*, the Twig Borer.

Natural regeneration is a patient partnership with Nature in the tending of the treelands. It is inexpensive, yet tardy, and it calls for huge areas, much time, and a prolonged analysis of the silvic complex. It is the perfect understanding of the inter-relation of the biotic factors of the forest association.

But Queensland cannot wait. Her case brooks no delay, and she must take silvical risks. In twenty-five years from now we will have no softwoods save what we can import and what we may grow within that time. In Europe it takes 120 years to grow 60,000 superficial feet of timber per acre, and two centuries is allowed for the production of an oak crop. The fundamental difference between agriculture and silviculture, after all, is one merely of the time element in crop production, but, to sow a field in the full realisation, that 200 years must elapse before harvest time, requires a more spacious faith, and a higher courage, than are called for ordinarily in rurual pursuits. This faith and this courage the forester possesses, and he is willing to apply to his investment the acid test of the compound interest table to prove that forestry yields at least as high a dividend as does agriculture.

In Queensland, however, a lesser strain is imposed upon the faith and the courage of the forester, because Nature comes to his aid with longer growing seasons, and more abundant rain and shine, and the forest-acre piles on wood increment at twice the pace of the snow-lands. In Florida, in India, and in the Philippines, where climatic circumstance parallels our own, and the rains fall in the summer, there are trees which produce a mean annual increment of 1,000 superficial feet per annum, or 60,000 superficial feet in sixty years, and from our knowledge of our own Hoop Pine, Bunya Pine, and Kauri Pine trees, we believe that these figures may be adopted safetly for the purpose of our local calculations in tree growth.

Our present population numbers 810,000; and assuming an increase of 2·3 per cent. per annum for the next sixty years, our Forest Working Plans Office estimates that in the year 1985, 3,170,000 Queenslanders will be clamouring at the

doors of the Queensland Forest Service for an allotted softwood ration of 100 superficial feet per capita per annum, as against 154 superficial feet, the present rate of consumption for the United States of America. To supply this quite conservative demand, the Queensland Forest Service must prepare now to place upon the wood market annually, 317,000,000 superficial feet of softwoods, or six times the present output of the timber reservations of the State. But our present timber reservations are merely "silvicultural" slums, original wildernesses carrying 3,000 or 4,000 feet per acre of prime trees. We may hope, however, to grow in artificial formation a stand of up to 60,000 superficial feet per acre, or 300,000,000 superficial feet for 6,000 acres of plantation. Five thousand acres, therefore, is the minimum area of softwood plantation annually to be laid down by the State. Barring accidents and with reinforcements from the areas under natural regeneration, Queensland may thus become assured of the required production of 300,000,000 superficial feet of softwoods per annum after 1985. In hardwoods we must produce a like amount. To accomplish the allotted task the sum of £100,000 will need to be invested annually in timber farming by the State, from next year henceforth.

Organised Timber Growing.

Thus develops the new State industry of organised timber-growing and the modern concept of State forests as the State's timber farms rather than as "coverts of vert" for the king's chase.

The practice of forestry has become the responsibility of the Government because private enterprise has not the patience to await final results, despite the expectancy of satisfactory accumulated dividends for the period of the rotation. The experience of State forest management in other countries is that the State is better qualified than is private enterprise to engage in this particular branch of rural industry, and it is the best equipped to bring it to a successful financial issue.

Dividends, however, are not secured in any enterprise without sustained efficiency, and to ensure them over a lengthy period meticulous long distance planning and close technical investigation are requisite.

Third class land may be cheaper than first class land, but rates of growth may be so slow thereon as to eliminate eventual profitability. Distant areas may be securable at a song for forest planting, yet a consideration of profit and loss elements may justify the securing of land on a city's edge so that the cost of haulage to market of bulky material be eliminated. Pure even-aged artificial stands may yield alluring returns for part or whole of a rotation, yet be devastated by the collapse of Nature's equilibrium.

These three considerations must be given due thought. The Forest Service will seek to place its man-made forests as close to railway line and market as possible, growing the greatest volume of wood at the closest point to the points of utilisation—viz., the cities; selecting No. 1 site qualities upon its reserves for its plantations and connecting them up to the natural regeneration areas upon the hills and poorer sites so as to form a complete pattern of forest regeneration by both artificial and natural means; so arranging its plantations in mixtures of species and age grouping as to avoid that over-artificialisation which brought about silvical reaction in some of the forests of Germany; and finally affording to the plantation, protection against its natural enemies, of fire, soil exposure, and rodent attack. By such means may Queensland's timber future be made good.

Financial Equilibrium and Biophysical Balance.

There are amiable folk whose enthusiasm for forestry would push us into the deserts and barrens where nothing might grow except trees and these but slowly and unprofitably. There are people who would urge us to plant larch and fir and Oregon and British oak in Queensland, not knowing the law of the forest which gives to some species the summer rainlands and to others the winter rain regions. But the forester must not be stampeded into planting panics nor depart from his patient building up of new forests having both financial equilibrium and biophysical balance.

There are, however, in Florida, in India, and in the Philippines, in similar climates to our own, trees which on similar soils might usefully be introduced to supplement our own native stores. Such trees have been observed by Queensland Forest Service officers in their natural haunts and are now being grown here experimentally. Already the Chir Pine of the Himalayas may be seen flourishing in Brisbane Gardens, whilst in the Rockhampton Botanical Gardens is thriving the Cypress tree of the knee deep Cypress swamps of Florida, this time upon a sunny

hillside. The important Caribbean and Loblolly Pines of the sand loam wet plains of the South-Eastern U.S.A. should grow equally well upon the better quality sites of the Beerwah-Beerburrum lands, and the Benguet Pine of the Philippines should succeed wherever Hoop Pine thrives. These trees and others the forester may call to his aid in Queensland to supply the needs of the expectant sawmills of sixty years hence with 48-inch logs. For larger logs the sawmills henceforth may whistle. It will not pay to grow them and we cannot wait. Wide boards will become antiquities and rotary veneering of massive logs will give way to other arts of the Forest Products Engineer and wood craftsman.

Providing for the Threatened Scarcity.

But for the pinch of twenty-five years hence, when our old forests will be exhausted and our new forests immature, and supplies from abroad are failing, certain lusty species may be grown emergently to fill in the interregnum. One such is *Pinus insignis*, the Remarkable Pine, a tree which grew unknown and unconsidered on Californian forests, but upon transportation to Australia waxed monstrously, and became notorious in Australasia as a wooden mushroom, which in plantation formation made wood, knotty wood it is true, but suitable for cases, 3,000 superficial feet of it in the log per acre per annum, until in twenty-six years it had piled up 76,000 superficial feet of trees ready for the saw.

This airy trunked, long-armed gaint of the woods comes from a winter-rainfall land and forestry doctrine condemns it for Queensland, but it succeeds in the cool region of Stanthorpe and puts on weight in great style at Imbil, whenever it escapes the domination of the native jungle. But there is danger in growing it out of bounds, and recourse will be had to its Mexican summer rainfall equivalent, *Pinus patula*, which is making its name in South African plantations.

Cedrela odorata, the Spanish Cedar of the cigar boxes, coming from the West Indies, is one very fast-growing softwood which may be introduced safely into this sub-tropical State. At the Imbil Forest Experiment Station it has reached 21 feet in two years from seed, and has added to itself the distinction thus far of defying *Hysiphyla robusta*, the Twig Borer, which keeps imprisoned in the jungles the last survivors of our own magnificent native *Cedrela*, the Red Cedar, and prevents its becoming one of the principal components of our planting schemes.

But Queensland can produce several other precocious young prodigies of the tree world. On Fraser Island, a handful of Blackbutt seeds became a forest of trees 80 feet high and 3 feet girth within the space of six years, whilst Spotted Gum and Flooded Gum give indications of being able to excel even this phenomenal increment. The softwood species, however, are our most urgent concern at this stage and the Forest Service has been gathering together data respecting several of our indigenous woods which have exhibited remarkable growth activity. Such are Southern Silky Oak and Quandong and Cypress Pine which planted now are expected to be fit for milling against the timber crisis of 1950, twenty-five years hence and thirty-five years before the new forests of Hoop and Bunya and Kauri Pine are scheduled to be logged.

It may be possible to grow these robust wood makers in mixture with our native pines, and to remove them as thinnings, before half the rotation is reached, thereby releasing the pines to faster future growth, and serving to supply the urgent needs of the interregnum between the old forests and the new. These actively growing species will be applied also to the Banana taungya proposition. Such a combination, if successful, is well calculated to answer the problems of the timber famine now bearing down upon us.

A Pressing Responsibility.

The case set forth for forestry in this lecture is not an alarmist one for mere noisy propaganda purposes. Definitely and decisively, Queensland must set about the establishment of her new forests at the rate of 5,000 acres of plantation per annum from next year hereafter, and at the same time put in train such natural regeneration operations as will make more productive the native natural grown timberlands upon which we must rely for our hardwood supplies and to supplement the softwood planting programme The cost of these necessary operations will be £100,000 per annum with a 2½ per cent. increase each year. Without this investment, Queensland will be left weeping for her forests and her timber industry.

The State has no more pressing responsibility than to provide for its future, and no duty more truly its own than that of the practice of forestry. The Queensland Forest Service has full faith that those things which should be done in these regards *will* be done by the State of Queensland for the safety of its otherwise assuredly glorious future.

THE HIGHER AGRICULTURAL EDUCATION OF THE FUTURE.

By EM. MARCHAL, Member of the Royal Academy of Science, Belgium; Professor of the State Institute of Agriculture, Gembloux.*

Nearly every country in the world possesses at the present time a system of Higher Agricultural Education representing in each case the most advanced stage of specialised instruction.

The actual role of this form of education as well as the question of organisation are the subjects of much controversy. Consequently unless active measures are taken without delay, it appears that agricultural education in certain countries is faced with a serious crisis. It seems therefore desirable to determine clearly the ends which should be pursued in these higher studies, so that they may be brought into line with the present general requirements of agriculture.

To judge from prevalent opinion, particularly as shown in Belguim, two opposing points of view are expressed in the quarters most closely concerned. Higher agricultural education as at present organised has been accused of being too theoretical so that the student is not kept sufficiently in touch with the realities of practical work. For example, it is stated that "the training provided at the agricultural colleges is much too scientific; it inspires the farmers' sons with too progressive scientific aspirations, and instead of preparing them for rural life tends to alienate them from work on the land."

For those who hold this opinion, the ideal function of the colleges is to give careful theoretical and practical instruction in the most approved cultural methods to students preferably themselves originating from the classes directly interested in the cultivation of the soil and thus to train practical scientific agriculturists who will in the future, by their example and influence, stand out as leaders in agricultural progress.

This desire to attract students from the country districts leads to the following characteristics in the arrangement of the programmes of study:—Comparatively easy conditions of entry, limited duration of the course, a constant effort to give a practical bias to all the branches of instruction (including the basic sciences), the predominance of practical work on the farm and in the fields, over laboratory and lecture work.

The contrary theory is represented by those who consider that the function of higher agricultural education is not only to train students who will disseminate the knowledge of the progress already attained, but also, and more especially to prepare pioneers, research workers, and the moulders of future agricultural progress. With this object in view the courses at the agricultural colleges, leaving aside all questions of professional training, should develop still further the scientific side and definitely take their place amongst the recognised higher University studies.

The writer during a long professional career has become convinced that, agricultural education can best serve the special interests of agricultural science and the general interests of society by following the latter course.

The history of the great discoveries, which during the last fifty years have brought about the transformation of the art of cultivating the soil, hitherto in its rudimentary and empirical stage, into a complex and scientific industry that shows at each step the marks of the direct influence of pure science. Similarly the discoveries made by chemists and physiologists in their laboratories towards the end of the last century have resulted in the establishment of fundamental laws which determine animal and plant production, while purely abstract biological theories are being utilised at the present time, as a basis for experimental work for still further enhancing the productivity of the soil. It is certain that the patient and laborious researches of Mendel, followed up and developed by a multitude of experimentalists, are the real source of the first definite stages of actual knowledge in the mysterious realm of heredity. Through the mutation theory of De Vries and the pure line selection theory of Johanssen, the Mendelian theory of heredity, still further confirmed as it has been by recent cytological research is dominant in the field of genetics, that most fruitful branch of biology, without which animal and plant breeding would be the merest empirism.

Viewed from another standpoint it must also be acknowledged that the purely theoretical work of mycologists and entomologists, by the light that it has thrown on the evolution of parasites in all its most minute details, has led to the establishment of a scientific basis for the methods of control of plant diseases and pests. Lastly, the peculiarly delicate investigations of bacteriologists and biologists have already begun to throw a certain light on soil microbian life and are opening up a prospect of interesting and profitable applications.

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* In "International Review of Science and Practice of Agriculture," N.S. Vol. 1, No. 2, 1923.

Everywhere and always, pure science constitutes the active source from which, although often it may be by long and devious paths, true practical progress is surely derived. The first stages in this development are multiple. The theory itself is almost invariably the work of scientists which is in no way concerned with the utilitarian aspect of the research work on which they are engaged. It is the affair of less original minds, with a more practical bias, to grasp its possible bearing as regards practical application. Then comes the testing of the new theory, and the stage of practical experiment and finally the general diffusion of the newly acquired knowledge amongst those to whom it is of importance.

However this may be, in any attempt to determine the part played by teaching institutions and research in furthering the great work of the scientific reform of agriculture, it must be admitted that the aim should be, pre-eminently to secure the necessary liason between pure theoretical science and practice and to select from among the original abstract theories of laboratory experts, the ideas that lend themselves to practical application, testing and adapting them to the actual requirements of agricultural technique and finally and above all, to arrange for their general diffusion. The creative side of such institutions, although entailing much expenditure of time and energy, has been regarded, as a general rule, as of relatively minor importance.

The reason for this situation is to be found chiefly in the method of recruiting professors and research workers, as it is too often the case that less importance is given to high scientific qualifications than to technical skill on the "practical" side, without which, so it is said, any branch of science however far reaching, often remains sterile in the sphere of application.

The result is that too often the duly qualified leaders of agricultural progress, are not, owing to their lack of sufficient scientific training, fit to undertake original research even under favourable conditions. No other result could well be expected, seeing that the nursery where they were trained and whence they are often far too exclusively recruited—*i.e.*, the institution for Higher Agricultural Education—is often marred by the same fundamental defect.

On the contrary, the march of agricultural progress might be made far more rapid and sure, and much of the labour, expense and trouble of testing and trials might be avoided if our agricultural scientists were given a superior equipment of pure science and could go direct to the original sources of the great discoveries for the maintenance of their activities.

Surveying the great problems in the light of their practical knowledge, and directing from the outset the resulting theories towards practical applications, they would cause science to become in the applied sphere, even more highly productive.

In the writer's opinion, the most urgent need of to-day is rather for true scientists, competent to achieve success in original research, rather than for able technicians or merely popular lecturers. The responsibility for training such men lies with higher agricultural education but if the work is to be adequately accomplished, higher agricultural education must develop and improve its methods and organisation in at any rate many countries.

If the ideal scheme for training such highly qualified advisers on agricultural science and practice be considered, it will be seen that the course may be divided into two sections: a general scientific preparatory training, and professional instruction proper. The first, owing to its specially comprehensive nature is the outstanding characteristic of agriculture instruction; briefly, it includes the various branches of mathematical, physico-chemical, mineral and biological sciences.

In each of these fields, it may be considered that the agricultural student should receive a training in no way inferior, either in range or standard, to that required for a degree in pure science. In the writer's opinion the bias in the direction of "practical application," which is so often abused in the methods of scientific teaching preliminary to specialisation, constitutes a serious danger, as it tends, under the pretext that they are abstract and devoid of any practical interest, to the sometimes almost complete neglect of entire sections of science, such as might ultimately be found to provide a source of important practical applications. Such a theory tends to encourage imperfectly qualified students with a limited horizon and sphere of interest, who will always be incapable of carrying out original research to advantage.

The University with its great thinkers and vast and precious teaching resources, is undoubtedly the most favourable milieu for the purely scientific training of the agricultural scientists of the future.

It should not be difficult, by means of judicious interchanges in the programmes of the different faculties to establish an ideal form of complete preliminary instruction, leading up to the special agricultural studies.

The agricultural scientist of the future in the next stages of his training course would thus be enabled to build up his purely professional instruction on the solid

foundations of the sciences in general. It is at this stage only that the professional faculty or, in other words, the Higher Agricultural Institute enters into the field. Situated in the country and in rural surroundings, where at every point the instruction can be refreshed and invigorated by practical demonstration, the Institute with its experiment farm, its research stations staffed with eminent scientists should prove a focus of applied science in direct and constant touch with the great general intellectual centre provided by the University town from which, consequently, it should not be too far distant.

The organisation of the programmes of study and the method followed at this Institute will not be inspired by the essentially abstract conceptions of pure theory, but the far more tangible and living requirements of science applied to practice.

In order, however, to safeguard, from the point of view of its specialised character, the type of education which is required, various dangers must be avoided. In certain special schools, though classed as of the "Higher" rank, there is a tendency to make the professional instruction degenerate into a kind of technical initiation into the practice of such and such a branch of agricultural industry or speculation. Under the guise of exercises in the adaptation of theory to practice, the student is required to carry out processes and manual operations, which could be far better learnt after the completion of his studies during the course of the stage which every student should pass through before starting on his professional career.

The subject of practical application in Higher professional instruction should take the form of training the student how to observe, measure, and analyse, to complete his knowledge by means of documentation, and to initiate him into experimental method and individual research. Such studies, it may be added, should tend to occupy an increasingly important position in the time table as their teaching value is inestimable. It is pre-eminently in the study of practical applications and tutorial work that the professor will find his chief opportunity for acting as initiator and revealer; it is at the point of contact of theory with fact that he will best be able to show his mastery and acquire that moral ascendency that will make his pupil respect and honour in his person both Science and professional ability. This is also the stage when he can most readily inspire the student with the love for research and the method to be pursued, by arousing his curiosity either in the progress and results of his special work or in other subjects equally capable of serving as a basis for original study. In short, the sphere of practical applications will give the professor the means for establishing on more solid bases than those of an examination, a sound appreciation of the value and real knowledge of a student.

For the student himself, the practical exercises will provide the opportunity of obtaining the most solid and lasting form of knowledge, of developing his spirit of initiative and testing his capacities and of gauging personally his degree of attainment. But, as already stated, the object of demonstration work and practical exercises must remain always at a high standard, as the period which the student can devote to his higher studies is too precious to be spent in carrying out work of a purely technical nature.

Another danger to be avoided in the higher agricultural course is in the writer's opinion the tendency towards an exaggerated specialisation. Agriculture viewed as a whole, undoubtedly occupies too vast a field to allow any individual to make a complete scientific study of all its branches. The agriculture of temperate and tropical countries respectively, forestry, horticulture, live stock, chemistry, technology, and farm engineering, all form special branches of which an intensive study can be made with the object of training special classes of scientific agriculturists.

It is necessary, however, to safeguard the general agricultural training which an extreme specialisation would jeopardise and to avoid turning out men with an incomplete equipment, who although well-trained in the minutest details of some particular branch, remain, owing to their insufficient knowledge of general methods and broad principles, incapable of seeing, understanding and adapting themselves to what takes place outside the narrow limits of their own accustomed sphere of activity.

A high level of preliminary scientific education, a far-reaching general professional training and a moderate degree of specialisation, such should, according to the views of the writer, be the qualifications which the agricultural scientist of to-morrow should be expected to supply.

It should be at once admitted that at present such a programme is already, at any rate in its essential lines, being carried out in several countries. Such countries have realised that the day of a relatively easy victory and diffusion of knowledge is ended and that for wresting from nature the secret of new wealth and for realising the imperious claims of improverished humanity in this troubled post-war period, for an increase in the productivity of the soil, an ever increasingly urgent appeal must be made to the aid of Science as the only true generating force of progress.

AUSTRALIA'S RESOURCES—HUMAN AND MATERIAL.

SOME THOUGHTS UPON THEIR MUTUAL RELATIONS.

By STIRLING TAYLOR, Director, Commonwealth Bureau of Commerce and Industry.*

Australia is fortunate in the possession of such material resources, both in their range and abundance, as are generally considered to be essential to the safety of a nation, and necessary if it is to develop a high standard of civilised life and an honoured status amongst the nations, as well as to attain any considerable degree of self-sufficiency.

In these respects, however, Australia is not singular, for other countries, notably Russia and China, possess resources that are possibly even greater than ours. But, necessary though these basic resources are before any country can become great and prosperous, their possession does not automatically ensure these results. Otherwise, the countries named would probably be preminent above all others, and the lesser territories of England, Germany, Japan, Italy, and others, admittedly great nations, would be of little account.

Essential though they are, purely material resources are of little worth unless the people who control them bring to bear upon them qualities of high intelligence and keen enterprise. And so we must place first amongst the many resources of this country the people themselves.

Nor is this statement the mere truism which at first sight it may appear. Land, labour, capital, and organisation are the four factors of production, the great pillars that uphold our system of civilisation, and the greatest of these is organisation. It is the brain of the organic order of modern society. And just as the human brain developed latest in physical evolution, differentiating man from the lower animals by his capacity for thought, so organisation is the soul of social evolution, spelling the difference between savagery and civilised life.

To pursue the analogy one step further, just as man has practically completed his purely physical development, and expands his personality by the improvement of his tools, so in his social life he is ever seeking progress through improvements in organisation.

As mere factors of production, land, labour, and capital are practically static; in the main all we can do with them we are already doing or know how to do. But the capacity of man to progress in the application of his brain to further systematisation and exploitation of the earth's resources is virtually as nearly limitless as the resources themselves.

The 6,000,000 Australians who constitute this young nation are, therefore, its greatest asset in actual wealth-making capacity, but far more so in their potentiality for further wealth-production through better organisation. And that means improvement of the individual type, through education and good conditions and improvement of the national system of wealth-getting and utilisation.

How high is the quality of intelligence of our people is strikingly shown in a table quoted in the Melbourne "Argus" for 7th February, 1925, in an article by D. G. Falk. In the psychological tests there summarised the immigrants to the United States of purely British stock come out far ahead, in intelligence and efficiency, of those of other nations. Australians naturally do not appear in such an immigration table, but we may fairly deduce that they would occupy at least as high a place as natives of England or Scotland, since they are the most thorough blending of these stocks—in an almost perfect environment—to be found in the whole world. It needs little imagination to conjecture the possibilities ahead of this young Commonwealth, with such a handsome start in the two great factors of heredity and environment—an almost untainted stock, of high intelligence, an entirely favourable climate, and a bounteous supply of natural wealth.

According to Mr. Wickens, Commonwealth Statistician, our population of less than six million people represents a capital value in the nation's books of £12,500,000,000. They are assessed upon their productive capacity individually at over £2,160. We derive much satisfaction from that statement. It certainly does look well alongside the estimates made of the economic value of other nationals. But is it, when our rare circumstances, the felicity of our land and climate, are taken into consideration, a ground for genuine satisfaction? I venture to say it is not. I suggest that the degree of utilisation of the man-power of this country—high as it may be by comparison with many other countries—is still lower than it

* An Address delivered at the Annual Conference of Patent Attorneys of Australia, Melbourne, 27th February, 1925.

should be. In our circumstances, 6,000,000 Australians should have a higher productive value than that indicated. It would appear that an undue proportion of them make no economic contribution to the life of the nation, that their energies are more or less wasted; they are not pulling their weight, while others are possibly overburdened. One may quote, not invidiously, the fact that probably well over 10,000 persons are directly and fully employed in connection with horse-racing in Australia—not counting the trades that serve the occupation partially or the multitude of hangers-on. If a survey of all the non-economic occupations of the Commonwealth were made, and a list of non-productive persons were compiled, the result would certainly prove startling.

Application of Mental to Material Resources.

But even having regard solely to the producers—and in that category must be included all who contribute to the well-being of the community—the position leaves much to be desired. If we called upon science for the aid readily available, and used the intelligence we undoubtedly possess, if we entered upon an overhaul of every department of our activities, I feel sure that there would be a different tale to tell. The growing complexity of modern economic society will ultimately force upon us this wholesale application of our mental to our material resources. We have lived too long upon our natural abundance. The splendid age of the rugged pioneer is over, and we have entered upon a new phase of our national development, that of well-planned and systematic discovery and exploitation of new means of increasing the national production. We have built up a nation of magnificent physique and keen mentality in a few generations out of nature's rich endowment, but just as every extra sea mile demands an ever-increasing percentage of coal consumption, so the additional rises in the standard of living to which our people still properly aspire can only be gained by the expenditure of scientific knowledge upon our rich resources. We have deliberately chosen to be a nation of high average comfort, and the price of the maintenance of that progressive standard is high average efficiency.

Our Agricultural Wealth.

Of all the natural recources necessary for man's welfare the agricultural and mineral come first in order of importance. Obviously I cannot here deal with either at any length, and propose only, and that merely in passing, to inquire into the degree of utilisation of our great agricultural wealth. I will thus endeavour to give practical cogency to the more theoretical arguments I have used so far.

The question we must obviously face is, "Are we utilising our lands to the fullest possible extent?" The answer must be an emphatic "No." If we look round upon other countries whose full utilisation of their agricultural resources is a necessity of their existence, we find a very different situation. In Japan we have, perhaps, the best example of a country approaching the full development of its resources.

With meagre mineral wealth, rugged topography, a small proportion of arable land, and a population of about 2,000 per square mile of tilled land—about three persons per acre—this country, until the recent sudden shift to commerce, supported itself almost entirely by agriculture with an average area of about 3 acres per farm family. Upon this slim resource, the nation has maintained its physical and intellectual vigor and a high civilisation; but to do so they entered almost exclusively upon the ultimate stage of agriculture—namely, the garden stage of hand labour and the non-meat diet.

But the experience of Japan is not for Australia's copying. Such extreme exploitation is impelled by the needs of teeming population and is accompanied by lower standards of living, and general social conditions that are not to be dreamt of for a moment in regard to our own country. We must, therefore, pursue instead, that degree of development, that intensity of utilisation which is open to us without any sacrifice of reasonable standards.

Belgium is said to be ahead of any other western nation in the utilisation of her resources. Her factory workers live upon the land to a degree unknown elsewhere. With his plot of ground there is room for production by the aid of women and children, old persons, and the spare time of the artisan himself. This garden product, the poultry, hares, and possibly the cows are great additions to a low wage and they conduce to the intensity of culture that gives large return per unit of land.

Nor is the somewhat toilsome example of the Belgian artisan-agriculturist a perfect guide to the Australian. But we can and ought to learn both from Japan and Belgium that a stage must come in the development of Australian land when closer application of labour and implements, and more scientific system must supersede the somewhat care-free and far-flung methods we have employed so far.

Sir T. H. Middleton, after his recent study of European agricultural development, estimates that "The British farmer feeds from forty to fifty persons by the produce of 100 acres of soil, while the German farmer feeds seventy to seventy-five persons by the produce of the same area." Here is his comparison of British and German agricultural output for the five years which immediately preceded the war. The figures for Australia have been added.

Agricultural Output per 100 *Acres of Land Cultivated.*

Foodstuffs.	Denmark, 1922. Tons.	Britain. Tons.	Germany. Tons.	Australia. Tons.
Corn	32	16	33	21⅓
Potatoes	17	11	55	2
Meat	4½	4	4½	4½
Milk	46	17½	28	18½
Sugar	¾	Negligible	2¾	1¾
Roots	187	—	—	—
Eggs (great hundreds)	105	—	—	—

These are very remarkable figures, and the contrast is so great that even if a considerable margin of error were involved, the comparison would be very unfavourable to British and Australian agriculture.

It is quite possible that these more or less crude comparisons need to be subjected to many considerations before we accept them as a precise measure of the value of the work done by the farmers of the first three countries.

The Transition from Extensive to Intensive Cultivation.

As is well known, all agrarian societies pass through the earlier stage of "extensive" cultivation to "intensive," with the progressive growth and concentration of population. In only a small measure and in limited areas has Australia reached the intensive phase. But what we call "closer settlement" is an indication of our growing needs. Closer settlement in Australia, however, is more than a response to economic necessity; it is in certain localities a much needed corrective to over-large and scattered holdings. In every new country settlers hold far more land than they can profitably use, and as the country fills up, the shrinking of the individual holding naturally follows. We have all witnessed that change proceeding in this country. This is generally a healthy process, yet sometimes the subdivision becomes too severe, and even in Australia examples of this are not unknown. Such holdings, too small to support the cultivator, are inevitably merged into another holding. The extreme example of this re-active process is France, where the Code Napoleon enforces family subdivision so far that inheritors of the smallest plots are forced to sell and depart elsewhere.

All Governments endeavour in some way—generally by definite legislation—to force land into use, or at least to encourage its use. But not enough care has been taken in determining the best possible uses for every kind of land. Thus we find orchards planted on unsuitable land, and cultivation of cereals in localities not at all suitable for their production. Even when the location is right and climate appropriate and the law-giver favours, say, an early variety, the grower often defies the law, and in the end is beaten.

Utilisation of Idle Lands.

To take another instance we have areas scattered, perhaps, but idle and at present useless which, whether large or small, could nevertheless be put to work growing timber. For this we have the assurance of the foresters, the men who know, and thus we could satisfy our daily commercial needs, and incidentally, no doubt, contribute to the regulation of the climate, or at least sometimes knit the surface, and lastly beautify the landscape.

European countries have been compelled to utilise their idle lands. France has afforested over 3,000,000 acres in the last century. Germany has added over 1,000,000 acres in the last fifty years, and she has by the greater care of her forests increased the production threefold. Denmark has 600,000 acres of afforested land and a further 75,000 acres in the process of afforestation. England is at present engaged upon a planting of about 15,000 acres per annum. The Agricultural Tribunal of Investigation which commenced to function in Britain in 1923 found that the planting of a new forest provided employment for about twelve men per 100 acres.

during the planting season, and afterwards for the care of the forest, felling, replanting, and the maintenance of roads, about one man per 100 acres. Germany employed, in 1907, 380,000 foresters on about 34,000,000 acres of forest.

The Driving Force of Organisation.

Governments and the Press are making some progress in their efforts to give direction to the energies of the people, but the driving force of ideas of organisation was never more needed than to-day. In the dairying section of agriculture, for example, it is still the exception, rather than the rule, systematically to test the herds. Indeed, only a small percentage of cows in Australia have ever been examined with a view to determining their value as butter-fat producers, and the result is that the cow-slave is still with us, and cow-slavery is as uneconomic and unprofitable as all other kinds of slavery. Strange though it may seem, dairymen still work for many of their cows, instead of having the cows, as they easily might, work for them.

The State Departments of Agriculture have for years been striving to bring efficiency into this primary industry. In this State (Victoria) the experts declare: "There are herds (run in the open all the year round, as is the practice in Australia) which are known to have averaged 466 lb. of butter-fat per fully matured cow, and there are undoubtedly herds which produce no more than 160 lb." "Denmark certainly stands out as a dairying country, yet there is no knowledge, technical or otherwise, available to the Danish dairyman, that is not equally available to the dairyman in Australia." Here we have a cardinal example of that want of the application of science which I have deplored throughout this address.

Higher Farming Efficiency.

The tendency to-day for agricultural products is towards lower price levels; but this does not necessarily entail lower wages, for the alternative is increased efficiency. Only by that means can we maintain our present standards. The farmer who fondly believes in the long continuity of high prices is living in a fool's paradise. The only hope for the future is in reduced costs of production through higher efficiency, and thus a fair maintenance of the profit level.

These considerations apply not only to the dairying industry, but to the whole field of industry; and we must realise—better now than later—that generally speaking one receives only what one earns, and it matters little whether one be employer or employee. Still more true is this of a nation, whose material reward is exactly limited by the extent to which it utilises its land, capital, and labour under up-to-date organisation.

And now let me attempt to sum up the position.

Our progress, up to the present, has been evolutionary and, on the whole, sound. We can visualise our industries as one vast whole—the farms, the mines, factories, railways, shipping, the banks, the warehouses, the shops—all part of a great organic system, working more or less in harmony, and regulated by the competitive principle, but otherwise free. This delicate, complicated machine is like any other piece of mechanism—it functions normally only when all its parts are fulfilling their special purposes, and the lubricating system is doing its duty. Economic society is becoming more complex every day, rendering imperative the closest attention to the service aspects of the system. The elasticity of man's want, says the economist, is infinite. Social evolution might, in fact, be described in those terms. Thus, modern man is constantly increasing the strain upon the service side, and this means ever-increasing efficiency of organisation and the loading up of the overhead cost of our civilised life.

Hard Thought and Keen Application are Needed.

Finally, we must face all these problems together. The problems of the country are the problems of the individuals as a collective unity, and yet the only solution is an individual solution in the sense that each of us must find it for himself in the last analysis.

It is a cure that is needed—not a sedative; not easy talk about the limitless resources of this country, but hard thinking and keen application. And this means co-operation on the part of all of us to produce the best results.

If, then, Australia is destined, as we believe it is, to become a great industrial and commercial country, the exploitation of her wealth must be facilitated on lines that use the latest scientific knowledge, the most up-to-date mechanical equipment, and employ to their fullest capacity the magnificent physical and mental endowment of our people.

CASSAVA.

BY T. A. GULLIVER.*

A good deal has appeared in the Press recently with regard to the advisability of growing Cassava in North Queensland for the purpose of producing power alcohol, but little, if anything, appeared as to the propagation and cultivation of the plant, and as the Cassava growing is rather a novelty in North Queensland there are probably many people who know very little about the plant. I therefore give a few particulars in the hope that they may be useful to the man on the land who could grow this most useful plant for home consumption, as well as to the farmer who would like to venture on a larger scale and grow it for the production of power alcohol. I must in the first place, however, point out that Cassava is not the name of the plant at all, but is the name of a product of the plant, namely, the purified fecula of the roots of the mandioc plants, Janipha Manihot or Manihot Utilissima and Jetrohpa Manihot, a genus of Euphorbiaceous plant. It is a native of tropical America, and the fleshy root yields the greatest portion of the daily food of the natives of tropical America, and is one of the products well known to us under the name of "Tapioca."

There are a large number of species of this plant all American, but Cassava or Mandioca meal is yielded by two species. These two species are so similar in appearance that most botanists combine them. They are Manihot Utilissima, the bitter Cassava, a shrubby plant from 6 to 8 ft. high, with erect twisted stems rising from long, thick, fleshy, cylindrical roots of a yellowish colour, containing a poisonous milky juice, and bearing deeply seven parted leaves; and Manihot Uipi, the sweet Cassava, which has sweet, wholesome roots of a reddish colour. The root of one is bitter, and a most virulent poison; that on the other is sweet and wholesome and is commonly eaten cooked as a vegetable.

Both species are extensively cultivated over the greater part of tropical America, and yields an abundance of wholesome and nutritious food.

The poison of the bitter kind is eliminated during the process of preparation it undergoes. This consists of first reducing the large, fleshy roots to a pulp by grating them, the poisonous juice being then expelled by pressure, and the residual mass is pounded into a coarse meal resembling bread crumbs. The poisonous expressed juice, if allowed to settle, deposits a large quantity of starch known as "Brazilian Arrowroot" or "Tapioca meal," from which the "Tapioca" of commerce is prepared by torrefying the moist starch upon hot plates, the heat causing the starch grains to swell and burst and become agglutinated together.

Another of the products of Cassava is an intoxicating beverage called Piwarrie, but the manner of brewing it is not calculated to render it tempting to Europeans.

Having described the plant and its uses we will now show how easily it is cultivated. Any waste, sandy ground will do, in fact, it will grow in almost pure sand, and when once established is almost drought proof. The land should, of course, be ploughed and harrowed to get rid of weeds and loosen the soil. Then furrows are drawn 6 ft. apart, in which to drop the cuttings, just as sugar cane is planted, only farther apart, say, 3 ft. between each cutting in the furrows; the furrows 6 ft. apart.

The time for planting greatly depends upon the weather conditions, but March or April are the best months as a rule, providing there is sufficient moisture in the land to give the cuttings a chance of rooting. Cuttings are made from the mature stems of the plant. These stems, which rise from 8 to 10 ft. from the fleshy roots, may be cut in 3 or 4 in. lengths, providing that each length contains two or three "eyes" or joints.

If the land be sufficiently moist the young leaves will show above ground in from ten to twelve days, after which the growth is very rapid. Nothing more is necessary except to keep the plants free from weeds by scarifying between the rows, taking care not to go too deep near the plants to damage the roots. A chipping hoe should be used near the plants. In about twelve months from planting the roots will have developed into huge tubers, and can be dug up for use. The yield is very heavy, 10 tons to the acre being an ordinary crop.

The larger tubers can be removed from the plants, and the immature tubers left to develop, but it is not profitable to allow the plants to remain too long as the tubers gradually become smaller and stringy. Two years would perhaps be the limit, and a fresh piece of land should then be planted.

The patches of land between the hills at Magnetic Island would be ideal spots for cultivating the Cassava plants. In fact, at Frenchman's Bay, now known as

* In the "Townsville Bulletin."

"Arcadia," the Cassava plant was flourishing over thirty years ago, and the Frenchman who resided there kept his pigs and fowls on the roots, and the Cassava root was used in the house just as sweet potatoes are.

When it is remembered that there are tens of thousands of acres of waste land between Mackay and Cape York where the Cassava plant would thrive, there is no limit to the amount of alcohol that could be produced from this plant for power purposes, and as very little labour is required in cultivating or harvesting it should be a paying proposition.

Cassava is best suited in sandy loam or loose forest land; in very rich soils there would be a tendency to make wood in the tops at the expense of the roots.

POULTRY ON THE FARM.

P. RUMBALL, Poultry Instructor.

From what I have seen of general mixed farms in Queensland, the poultry kept ranges from indifferent to good producers. In numerous cases good stock has been purchased, but by allowing them to cross with the original stock kept, they have quickly degenerated, and in nearly all cases there are fully 30 per cent. unprofitable. The retaining of these unprofitable birds, together with unsystematic marketing of eggs, means that they are kept at a loss.

It is essential to keep only good producers, and so minimise the cost of production. One hundred good laying birds require little more feeding than 100 poor layers, and need no more care or attention.

To improve the egg yield it is necessary to select the best layers, pen and mate them with a well-bred bird, and hatch only from their eggs. The general farmer has not the time, as a rule, to pay much attention to the breeding of stud stock, and he will probably find it advisable to procure his male birds from reliable stud breeders. These roosters may be used for two or more seasons, and their purchase money will be more than recouped by improved returns in stock and production.

An illustration of what may be accomplished is seen from the accompanying plate of a grading-up experiment conducted in America.

In this experiment B represents a fair specimen of the female used and A the purebred cockerel. C is one of the progeny of A and B, and birds of her type were again mated with another purebred cockerel of which D is the offspring. D was then mated with a purebred male and E and F are fair specimens of their progeny.

This illustrates the ease with which our general farmers' flocks may be improved both in type and size, and it is possible to make a corresponding improvement in egg-production.

POULTRY—MATING BREEDING STOCK.

"On the question of matings many inquiries are made as to ages and conditions. Should cockerels be mated to pullets, hens to cocks, cockerels to hens, or cocks to pullets are some of the queries usual at this time of the year. In this regard truth and fallacy are curiously mixed," writes the New South Wales Poultry Expert in current notes. To answer these questions one requires to be in possession of information as to all the conditions in each case, but the determining factors can be stated thus:—

There is nothing against mating pullets and cockerels, providing (*a*) the ages are ten months and over when eggs are required for incubation; (*b*) that both sexes are well-developed specimens; and (*c*) that they are not too closely related. Both (*b*) and (*c*) are applicable to each of the mentioned classes. The idea that age is necessary on one side or the other can be ignored except to say that birds under the age mentioned are immature and it is inadvisable to breed from them.

With regard to mating older birds on both sides two factors have to be reckoned with. Aged hens are likely to be a month or six weeks later in commencing to lay than good forward pullets. On the other side, aged males, especially in heavy breeds, are not as a rule very dependable in the winter. The result in either case might be a late start with hatching as compared with the possibilities from younger stock.

Another common query is with regard to blood relationship in matings. This is a more complex question than is generally imagined. It is not sufficient to make matings according to some chart showing a mathematical procedure on blood lines.

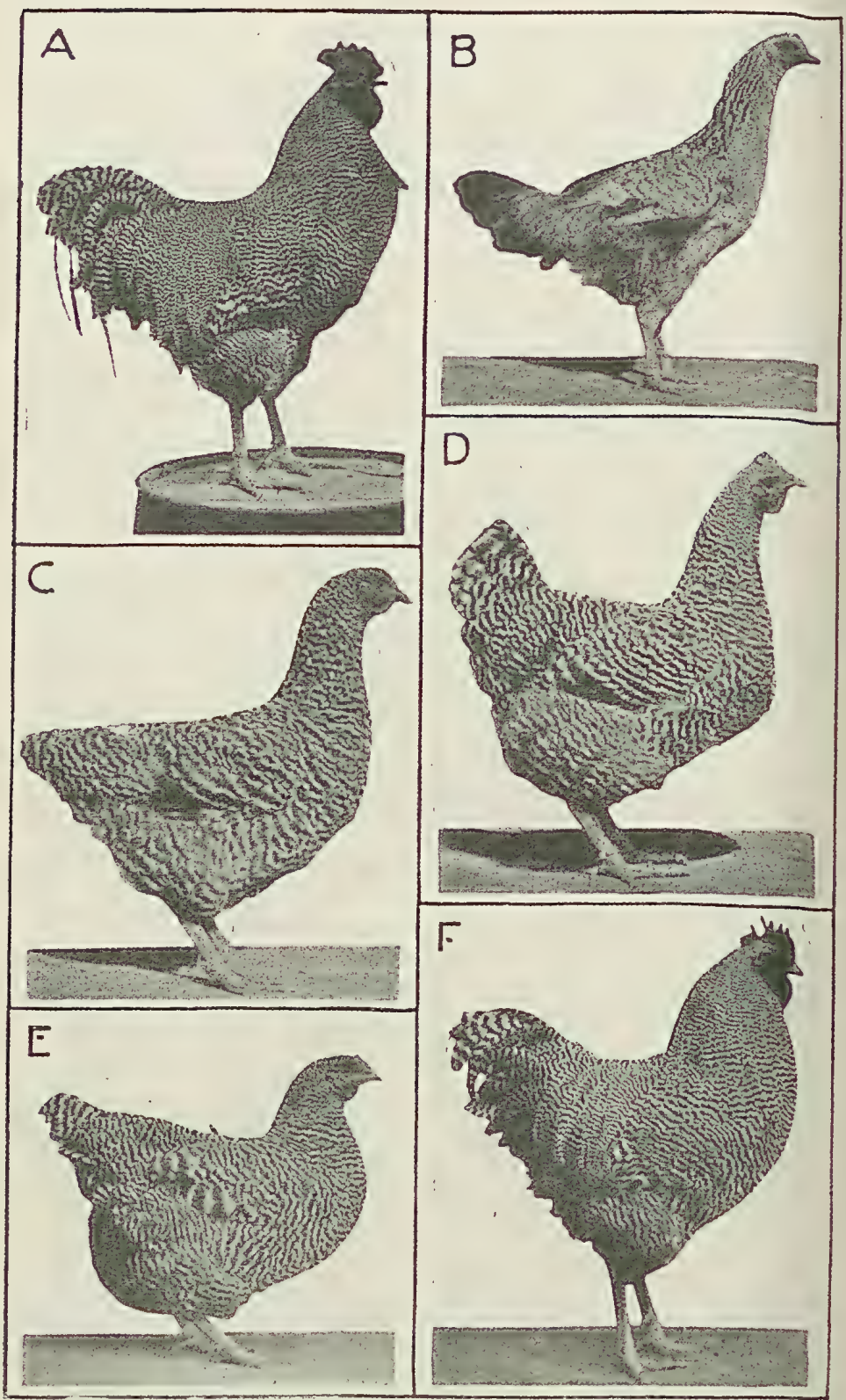

PLATE 69.—RESULTS OF GRADING-UP EXPERIMENT AT EXPERIMENTAL FARM OF UNITED STATES DEPARTMENT OF AGRICULTURE.

By itself this might lead to degeneracy. It is only by proper selection, keeping in mind the main objective, that any good can come out of line breeding either in egg production or in quality in other respects. In short, selection must take precedence over all other factors. The facts in this connection are that many farmers who are obsessed with the idea that line breeding is the be-all and end-all of high production capacity might do better by outcrossing, if they kept in view affinity of type and character of the birds to be mated.

It is now a known fact, the outcome of experiments, that many high layers produce pullets of low productive capacity, and also that some low-producing hens are the dams of high-producing pullets. There is, therefore, all the more need for intelligent continuous selection of the specimens to be mated. In making such selections, length, breadth, and depth, according to the breeds, are points that must be taken into account. Good development in these points indicates constitution, while fine quality in head points (such as texture of comb and wattles and length and fineness of skull) and pliability of the skin of the abdomen are indicative of high laying ability. Coarseness in any of these points indicates the poor layer.

In this connection it might be pointed out that, while there may be no formula for breeding layers, much can be accomplished by making good selections for breeding stock continuously year after year. This must be regarded as the supreme factor in any effort to increase average laying capacity. Side by side must also proceed selection for the maintenance of constitutional vigour.

When selecting White Leghorn pullets as breeders at this time of the year most of the early hatched birds will lack that freshness in appearance to be seen in the later ones. This is due to the fact that they have, perhaps, been laying for some time, and are breaking into moult. The selector should not be deceived by this feature. It is to the older pullets he must look for his breeding stock. This fact will, of course, increase the difficulty of making a good selection unless the birds have been marked while fresh. With regard to the hens, those selected as breeders should have finished their moult before the end of May; any later than that will come into the category of late moulters, too late to make good breeders. Birds carrying their old feather into mid-winter will not have time to recover from the somewhat exhausting period of moult in time for the breeding pens.

WEEDS OF QUEENSLAND.

No. 39.

By C. T. WHITE, F.L.S., Government Botanist.

NARROW-LEAVED SAGE (*Salvia lanceifolia*).

Description.—A strong smelling, much branched, annual weed, the young parts clothed with short stiff hairs; stems angular. Leaves densely clothed on the under surface with short stiff hairs, the upper surface smooth or nearly so, varying from oblong to lanceolate, 1-2 inches long and about ¼ inch wide, on slender stalks of ¼-½ inch, margins entire or rather irregularly toothed. Flowers opposite or 3-4 in a whorl in slender terminal racemes. Calyx 2-3 lines long, strongly ribbed and the ribs clothed with short stiff hairs. Corolla blue, about 4 lines long, prominently 2-lipped, the lower lip twice as long as the upper; stamens two, the lower ends of the connectives dilated into a broad lobed appendage; ovary 4-lobed, style 2-lobed, one lobe much larger than the other, nutlets (seeds) angular, pale-straw coloured.

Distribution.—A native of the United States and Mexico. It has been naturalised in Queensland for some years, first making its appearance in the Pittsworth district. It has now spread to other parts of the Downs and threatens to become a bad weed.

Botanical Name.—Salvia, from the Latin *salvo*, I save, on account of the use of several species of the genus as healing and curative herbs; *lanceifolia* from the Latin, *lancea* a lance or spear and *folium* a leaf, in reference to the shape of the leaves.

Properties.—The plant is not known to possess any economic properties. Pammell (Manual of Poisonous Plants, p. 710) records it as a troublesome weed in the Western United States. In Queensland I have received specimens with the report that the plant is harmful to the grass and that it is deleterious to stock, but more detailed information than we have at present is necessary on these points before we can regard them as definite.

Botanical Reference.—*Salvia lanceifolia*, Poir in Lam. Encyl., Suppl. 5, 49, 1817. *S. lanceolata* Brouss. non Lam.

PLATE 70.—SALVIA LANCEIFOLIA.

Narrow-leaved or lance-leaved sage. A.—Stamens showing the broad and lobed nature of the lower connective (a character of the species). B.—Pistil showing 4-lobed ovay and 2-lobed style (one lobe much longer than the other). C.—"Seeds."

MOUNT GRAVATT EGG-LAYING COMPETITION.

Following are the final results for the test which commenced on the 3rd April, 1924, and terminated 31st March last. Although no individual records were obtained, the average of 204.6 eggs per bird is highly satisfactory. The pens disqualified for under-weight eggs are marked U, and the X opposite the individual score indicates that the total includes the eggs laid by both original and replaced birds.

SECTION 1.

White Leghorns (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Grand Total.
W. and G. W. Hindes	251	263	271	291	260	226	1562U
T. H. Craig	237	256	234	274	196	241	1438
S. Grenier	246x	220	273	222	202	261	1424
H. Fraser	257	208	236	261	243	213	1418
Mrs. L. Anderson	248	241	237	255	206	224	1411U
W. Wakefield	135	240	260	226	263	267	1391
W. H. Flowers	185	187	243	258	263	253	1389U
G. Marks	285	235	220	227	218	198	1383
L. Bird	229	226	227	162	270	260	1374U
T. W. Honeywell	213	265	207	229	235	198	1347
H. T. Britten	273	258	204	224	160x	220	1339
G. W. Cox	235	185	253	158	276	223	1335
Oakleigh Poultry Farm	167	258	190	205	256	247	1323
B. Driver	212	179	177	272	232	241	1313
J. E. G. Purnell	217	192	163	229	258	238	1297
Mrs. R. E. Hodge	201	232	179	238	216	219	1285
R. C. J. Turner	216	231	201	221	159	213	1241
A. Neil	252	233	229	212	97	199	1222U
John J. McLachlan	148x	180	270	217	254	146x	1215
Kidd Brothers	224	206	174	230	159	219	1212
H. P. Clarke	219	167	195	211	204	206	1202
L. J. Silman	210	235	164	198	202	185	1194
J. W. Newton	213	205	169	186	188	223	1184
W. McHardie (Anconas)	221	192	163	192	204	194	1166
Arch. A. Sterling (Anconas)	170	151	228	215	172	206	1142U
W. T. Melrose	117x	177	238	258	88	226	1104U
G. Williams	123	45	248	241	218	226	1101
T. W. Biddulph	265	239	131	184	114	161	1094
Ancona Club, No. 2	204	165	114	147	194	153	977
Chris. A. Goss	10	257	112	131	234	230	974U
Ancona Club, Pen No. 1	143	176	189	210	87	17	822

SECTION 2.

Black Orpingtons (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Grand Total.
James Hutton	247	287	259	197	215	232	1437
Mrs. A. E. Gallagher	223	257	197	237	228	195	1337
James Potter	214	252	212	195	226	205	1304U
R. Burns	198x	227	234	231	192	221	1303
H. G. Stevens	246	221	204	176	196	168	1211
Kidd Bros.	188	217	183	204	212	166	1170
Mrs. A. Kent	217	256	113	187	167	211	1151
Carinya P. Farm	129	170	203x	167	206	235	1110U
H. M. Chaille	196	204	240	171	239	37	1087U
A. E. Walters	172x	147	126	246x	257	136	1084
J. Ferguson	87	169	161	215	210	230	1072
E. C. Stead (Wyandottes)	134	211	164	212	181	165	1067U
T. W. Lenny	195	153	212	130	148	206	1044U
W. and G. W. Hindes	185	94	222	138	231	146	1016U

W. D. DELL.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1925 AND 1924, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1925.	Mar., 1924.
North Coast.	In.		In.	In.
Atherton	8·96	24	15·30	6 71
Cairns	18·09	43	28·04	15 81
Cardwell	16·27	53	23·92	25·37
Cooktown	15·33	49	27·98	12·68
Herberton	8·24	38	8·97	6·94
Ingham	15·74	33	24·13	15·11
Innisfail	26·16	44	43·04	41·96
Mossman	17·24	17	37·47	13·59
Townsville	7·72	54	7·36	12·76
Central Coast.				
Ayr	6·95	38	5·01	4·42
Bowen	5·78	54	4·86	3·10
Charters Towers ..	3·75	43	2·03	6 24
Mackay	12·13	54	14·87	4·31
Proserpine	11·66	22	19·62	5·51
St. Lawrence ...	5·80	54	2·23	2·66
South Coast.				
Biggenden	4·06	26	2·52	3·17
Bundaberg	5·38	42	5·70	7·84
Brisbane	5 81	74	9·26	3·45
Childers	4·87	30	3·73	4·80
Crohamhurst ...	11·67	30	18·44	8·51
Esk	4·85	38	7·49	4·78
Gayndah	3·23	54	1·57	2·26
Gympie	6·17	55	11·39	4·79
Caboolture	7·62	38	13·19	4·85
Kilkivan	3·98	46	2·96	3·80
Maryborough ...	6·23	53	6·90	7·37

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1925.	Mar., 1924.
South Coast—continued:	In.		In.	In.
Nambour	9·21	29	18·04	6·28
Nanango	3·36	43	2·97	3·60
Rockhampton ...	4·87	38	2·00	5·33
Woodford	7·99	38	14·67	6·47
Darling Downs.				
Dalby	2·71	55	2·89	3·18
Emu Vale	2·55	29	1·77	2·53
Jimbour	2 61	37	1·93	1·81
Miles	2·71	40	2·27	4·64
Stanthorpe ...	2·74	52	2·42	1·88
Toowoomba ...	3·87	53	4·66	5·27
Warwick	2·64	60	0·75	2·52
Maranoa.				
Roma	2·80	51	1·23	3·11
State Farms, &c.				
Bungeworgorai ...	1·77	11	1·35	3·48
Gatton College ...	3·34	26	3·15	2·83
Gindie	2·70	26	0·38	0·16
Hermitage ...	2·39	19	1·09	2·38
Kairi	8·28	10	...	8·21
Sugar Experiment Station, Mackay	10·95	28	14·68	3·89
Warren	2·69	11	1·96	4 92

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

QUEENSLAND SHOW DATES FOR 1925.

May 5–6 —Taroom A. and P. Association (T. O'Malley, Secretary).
6–7 —Central Warrego P. and A. Association, Charleville (W. R. Sinnott, Secretary).
6–7 —Longreach.
6–7 —Maleny A., I., P., and R. Society (G. B. Sutton, Secretary).
6–7 —Toogoolawah D., A., and I. Association (Douglas Young, Secretary).
7–8 —Nanango.
13–14—Springsure.
13–14—Maranoa P., A., and I. Association, Mitchell (W. J. Rogencamp, Secretary).

May 13-14—Fassifern A. and P. Association, Boonah (G. E. Ball, Secretary).
13-14—Murgon P., A., and H. Society (N. Waldock, Secretary).
20-21—Emerald.
20-21—Western P. and A. Association, Roma (F. W. Mills, Secretary).
20-22—Queensland P. and A. Society, Ipswich (H. W. Watson, Secretary).
26-27—Wallumbilla A. and P. Association (M. J. Grace, Secretary).
27-28—Esk P., A., and I. Association (T. C. Pryde, Secretary).
June 2-3 —Marburg and District A. and I. Association (G. E. Dance, Secretary).
2-3 —Hughenden.
2-4 —Maryborough.
3 —Brookfield, Pullen Vale, and Moggill Farmers' Association (John Phillips, Secretary).
3-4 —Logan and Albert A. and P. Society, Beaudesert (P. F. Dever, Secretary).
3-4 —Proserpine.
6 —Buderim Mountain A. and I. Society (S. Anderson, Secretary).
6-9 —Isis District P., A., and I. Society (C. M. Wrench, Secretary).
11-13—Bundaberg.
15-17—Gin Gin.
17-18—Woombye.
18-19—Gladstone.
19-20—Lowood and Tarampa P. and A. Association (S. Coleman, Secretary).
23-27—Rockhampton Agricultural Society (H. Hill, Secretary).
30 } Mackay.
July 1-2 }
1-2 —Lockyer A. and I. Society, Gatton (Percy Skinner, Secretary)
2-3 —Biggenden A. and P. Society (C. J. Stephensen, Secretary).
2-3 —Kilcoy.
3-4 —Sandgate A., H. and I. Association (W. F. Kenny, Secretary).
7-9 —Townsville.
8-9 —Laidley.
9-10—Woodford.
11—Wellington Point.
July 15-16—Charters Towers.
16-17—Caboolture.
22-23—Ingham.
24-25—Ayr.
24-25—Rosewood A. and H. Association (R. J. Walsh, Secretary).
24-25—Ithaca A. and I. Association (T. A. Bennion, Secretary).
29-30—Bowen.
31 } Pine Rivers.
Aug 1 }
1 —Mount Gravatt.
5-6 —Humpybong A., H. and I. Society, Redcliffe (C. G. Graves, Secretary).
10-15—Royal National A. and I. Association of Queensland, Brisbane (J. Bain, Secretary).
26-27—Crow's Nest A., H. and I. Society (J. Pike, Secretary).
26-27—Charters Towers H. Society (James H. Chappel, Secretary).
Sept. 2-3 —Esk Bushmen's Carnival.
4-5 —Wynnum.
12—Zillmere.
24-25—A. and P. Society of Southern Queensland, Beenleigh (W. Laughlin Secretary).
26—Rocklea A. and I. Society (C. R. Gwynne, Secretary).
26—Maroochydore Agricultural Society.
Oct. 1 —Kenilworth P., A., H. and I. Society (R. Houston, Secretary).
2-3 —Toombul A., H. and I. Association (A. J. Thompson, Secretary).
2-3 —Johnstone River A. Society (M. O'Callaghan, Secretary).
9 —Southport A., H. and I. Society (S. H. Earl, Secretary).
10—Enoggera A., H. and I. Association (N. Thomson, Secretary).
16—Nerang.

WEANING THE PIG.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Among matters worthy of special attention on the pig farm is that dealing with the correct age at which to wean the pigs. There is no hard and fast rule that must be followed to ensure success, as the age at which to wean the pigs will depend largely on the system of management that is followed on the farm.

If it is intended (as it should be) that the sow is to produce two litters yearly, it will be necessary to wean the pigs as early as practicable in order to allow of the sow being mated in time for the next farrowing. For this reason, it is advisable to wean the pigs when they are eight weeks old. The sow carries her pigs for four months (the gestation period is usually 112 days), and suckles them for two months, making six months in all with each litter. In general the sow will come in season three days after farrowing, and every three weeks (or twenty-one days) after that, although it rarely happens that the sow will "show" as being "on heat" before the ninth week after farrowing, and it is at this ninth-week period when it is advisable that she should be mated to the boar.

Some breeders are able, in the case of a sow with a very small litter, to induce the sow to come "in season" by keeping her and her litter separated for several nights in succession at about the sixth week after birth or even sometimes at the three-day or three-week period. In cases of this description, it is sometimes an advantage to feed the sow more liberally after going "in pig" and to allow her to suckle her pigs for a longer period, but this system can only be recommended in cases where the sow has a small litter or where the sow is carrying plenty of condition, for the gestation and lactation periods are severe on the dam and impose a double burden on her at a time when should be storing nutrients and building up her body generally in preparation for the litter to arrive and be suckled.

If the young pigs, when about three or four weeks old, are provided with a small trough (a concrete, steel, or block tin trough preferred) placed in some convenient spot where the sow cannot get at the trough, they will soon learn to eat and drink freely, and if they are also allowed good pasture, the process of weaning will not prove a hardship, nor will the pigs be checked in growth. The strain on the sow will not be as great either if the young pigs are handled in this way. Both sow and suckers should also be allowed an abundant supply of drinking water. If, on the other hand, care and attention are not bestowed on both sow and litter, and if the young pigs have to depend on battling and fighting at the trough for a mouthful of feed while the sow and perhaps other pigs are feeding, then the weaning period will be a very severe one on the pigs, and the sow will not do as well.

For three or four days previous to weaning time, the sow that is to be weaned off her pigs should only receive about one half of her ordinary ration; this will cause a decrease in the milk flow. It is usually then advisable to take the sow away from the litter, leaving the young pigs in the same pens or pasture that they have been accustomed to. These pens and pastures should be clean, sanitary, and of good area, and so be conducive to rapid growth and gain in weight.

The sow should be handled carefully until her milk flow dries up. Some breeders allow the smallest pigs to remain with the sow for a week or so longer after the largest ones have been weaned, and this practice is to be commended, particularly if the sow has an abundant supply of milk and has been rearing a large litter. At any other time, weaning might take place when the pigs are eight weeks old. It is a decided advantage, if it can be so arranged, to allow a small weakly litter to remain on the sow until the pigs are about ten or twelve weeks old, in order to give them the additional benefit of the sow's milk, but this will hardly be necessary if the young pigs have been taught to eat from a separate trough whilst still suckling the mother.

Young pigs should be given an allowance of lime-water in their milk or other food two or three times a week, they should always have access to a water supply, and should be provided with charcoal, bone meal, and wood ashes, as well as with a lump of rock salt to lick at their leisure.

Given these conditions, weaning should not check their development.

PLATE 71.—A BONNY LITTER JUST READY FOR WEANING.

The Second Prize litter at Sydney Show, 1924, exhibited by the owner, Mr. M. Marshall, Herdsman for Mr. Ralph Joyce, of Kyabram, Victoria. These pigs were sired by the Champion Boar "Drayton's Chief," and were from that well-known prize-winning sow "Leona."

Pigs of this quality are not difficult to handle for they have become accustomed to other food in addition to the mother's milk before weaning. Note their even development, splendid quality, and rapid growth.

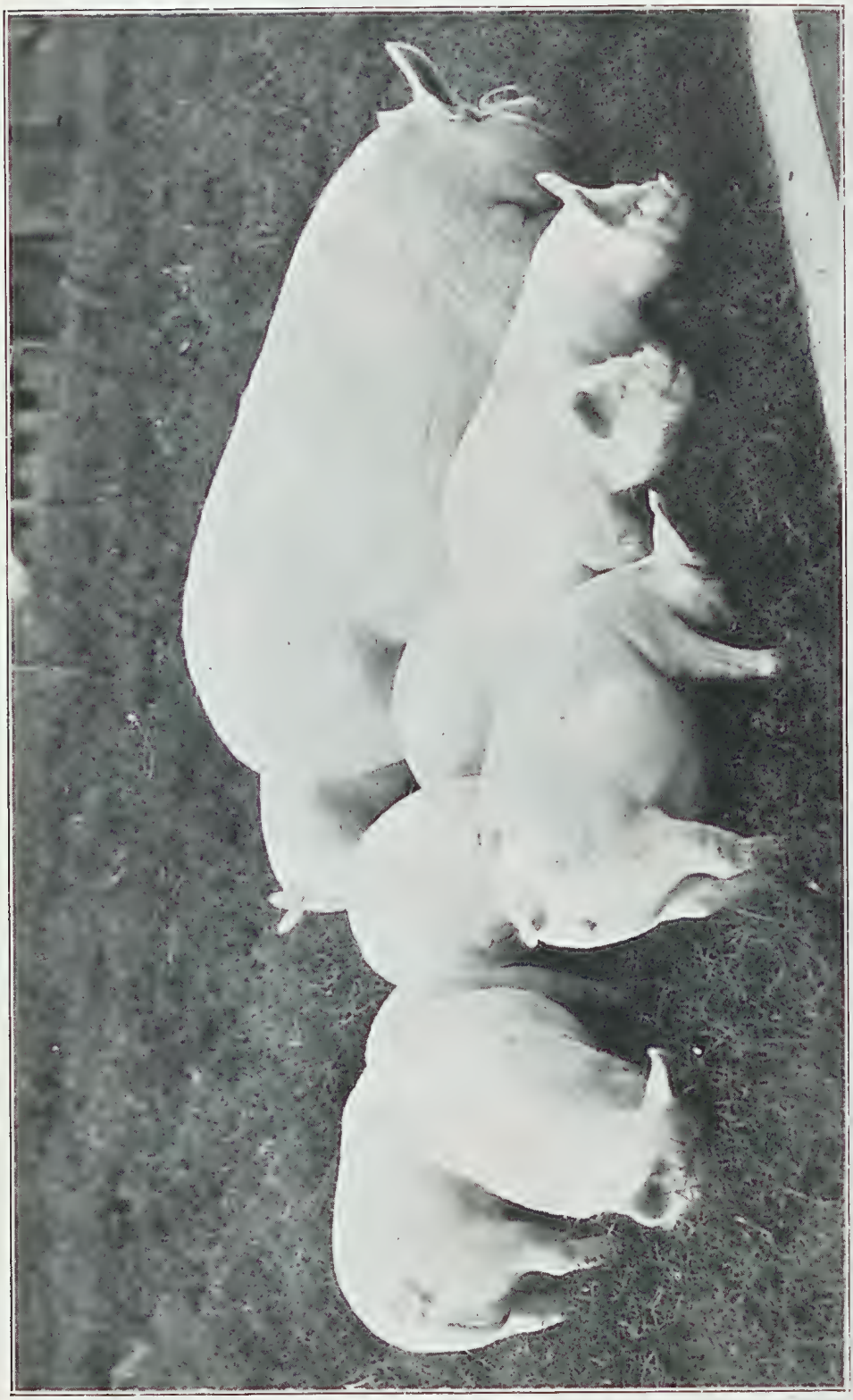

PLATE 72.—FIRST PRIZE MIDDLE YORKSHIRE SOW WITH LITTER, SYDNEY SHOW, 1924.

Ralph Joyce's "Kyabram Beauty" 2465. The litter is sired by "Coloraine" 2234, who won the Progeny Group Prize, Royal Show, Melbourne, 1922. This litter was line-bred. The sow only had the seven pigs, but made an exceptionally good job rearing them. The small black spots on the backs of the suckers are stje (paint) marks only. An exceptionally well-developed lot.

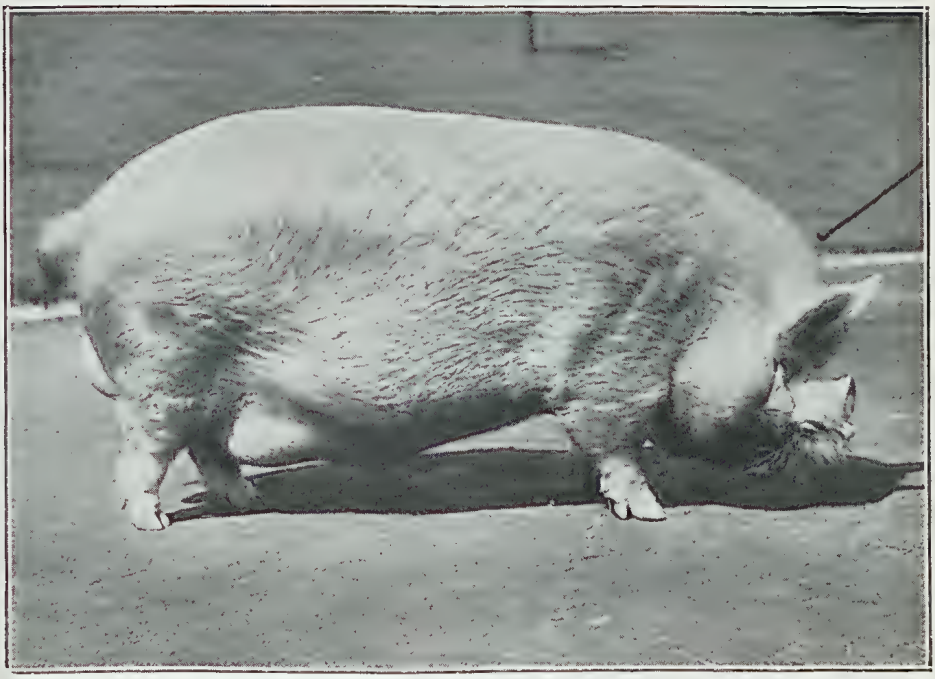

PLATE 73.—W. J. WARBURTON'S CHAMPION MIDDLE YORKSHIRE BOAR, "NEWINGTON ADVENTURER," 2090, CHAMPION AND HERD BOOK RIBBON BOAR, SYDNEY SHOW, 1925.

Mr. Warburton, of Northgate, won both Male and Female Championships with his Middle Yorkshires, as well as several other important awards. His pigs were shown in excellent condition as noted by the type, conformity, and finish of this great quality sire—(*See* Letterpress p. 429).

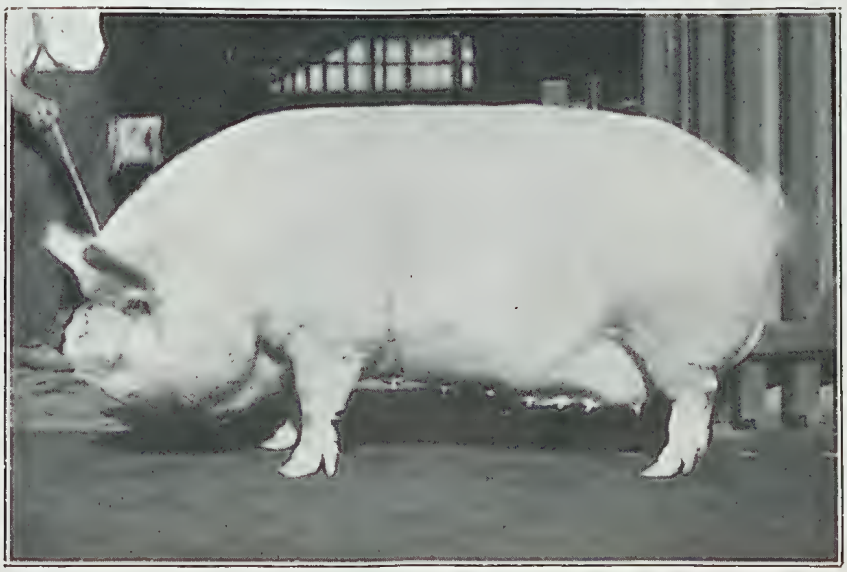

PLATE 74.—W. J. WARBURTON'S CHAMPION MIDDLE YORKSHIRE SOW "NEWINGTON SNOWFLAKE" 2093, SYDNEY SHOW, 1925.

A sow noted for prolificacy, docility, trueness to type, and splendid quality. (*See* Letterpress p. 429).

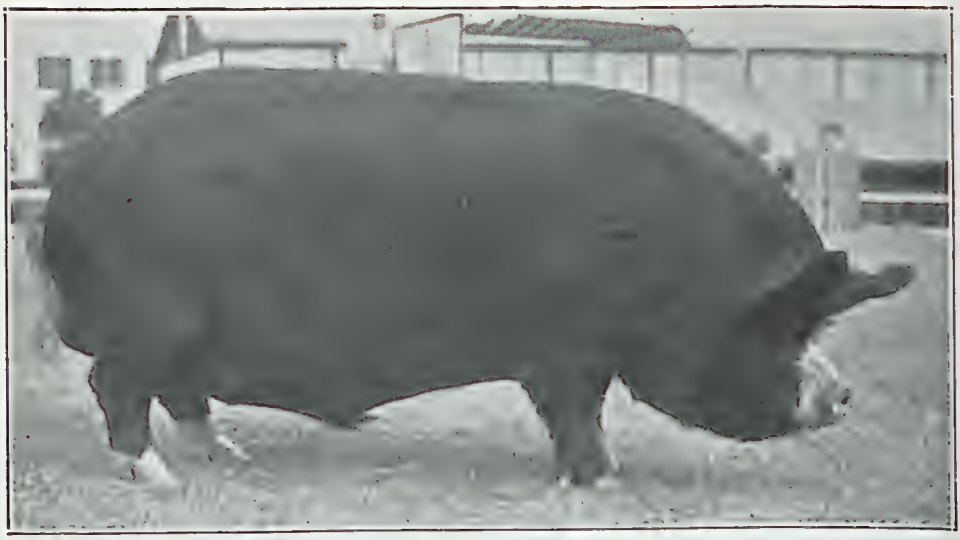

PLATE 75.—THE CHAMPION BERKSHIRE BOAR AND HERD BOOK RIBBON WINNER, SYDNEY SHOW, 1925. KELBURN STUD PIG FARMS IMPORTED "SUDDON SYDNEY" 5169.

A Boar of great quality and type, imported by Mr. A. J. Tanner from the stud of J. A. Fricker, Stalbridge, Dorset, England—(*See* Letterpress p. 429).

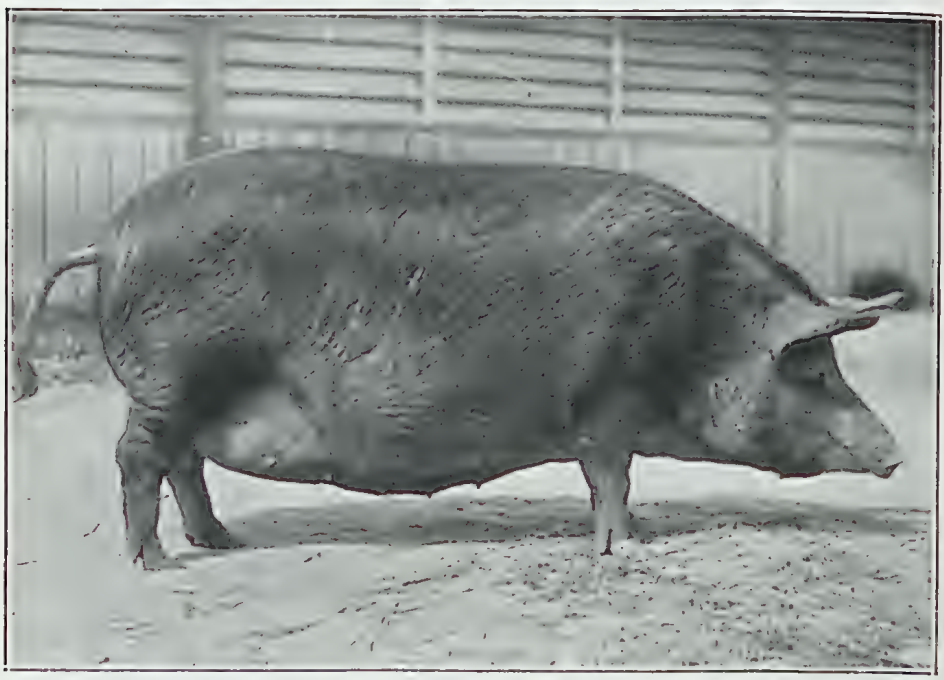

PLATE 76.—C. J. FRANKS'S CHAMPION PRIZE AND HERD BOOK RIBBON, TAMWORTH SOW, SYDNEY SHOW, 1925.

This sow, "Manning Elnore" 243, bred by Fred S. Martin, of Burrell Creek, New South Wales, was purchased as a prize-winner by Mr. Franks some time ago, and has given most satisfactory results at his Stud Farm at Coramba, New South Wales. This sow shows great quality and development. Special features worthy of note being the depth and compactness of the hindquarters, the deep and capacious chest, and the trueness to type. One of her sons was purchased for the Queensland Agricultural High School and College, Gatton, while two of her daughters were secured by the Department of Agriculture and Stock for the State Farm Stud at Kairi, North Queensland—(*See* Letterpress p. 429).

PLATE 77.—FINDING THE PEAS.

A group of young pigs at the Warren State Farm after weaning. These young pigs had the benefit of a roomy pasture, portion of which had been well littered over with Cow Pea hay, the pigs appear to be enjoying the search for the hidden peas.

TURNIPS AS STOCK FOOD.

The following may be taken as the average composition of a Swede root:—Water, 88 parts; ash, 1·2; protein, 1·2; fibre, 1·3; carbohydrates or nitrogen-free extract, 7·5; fat, ·2. Although the percentage of water appears high, it must be remembered that the dry matter is practically all digestible. This cannot be said of a great many other stock foods.

Succulence, bulk, palatableness, digestibility of the dry matter, and the high percentage of sugar contained, give turnips a peculiar value as a food. Sheep and goats fatten readily when fed on them alone, and they are also valuable for pigs and cattle, coming in at a time when other foods are often scarce. They should be fed to dry stock on the dairy farm in preference to milch cows, as if given to the latter the milk will be tainted. The Swede turnip possesses good keeping qualities, and may be either stored or left in the field for a couple of months till required. If left for any considerable length of time the proportion of woody matter increases, rendering the root unpalatable and less easily digested.

Swedes should be cut in pieces before being fed to cattle, as the animals are apt to swallow the whole or a large portion of a root, and the shape of the piece may result in it becoming stuck in the gullet when it is forced back into the mouth for rumination. The choking so produced has killed more than one cow.

Sheep may be utilised for feeding off a crop without the labour of digging; when confined to limited areas by means of portable fences, they will eat out the whole of a crop, leaving only a thin shell that, together with the animal residues, will plough in to advantage.

PLATE 78.—POWER-FARMING AT QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, GATTON. FARMERS AT THE EASTER TRACTOR SCHOOL.

PLATE 79.—SPEEDING THE PLOUGH.

The Tractor School for Farmers at the College at Gatton is proving one of the most popular and successful features of the activities of this progressive Institution.

STUD PIGS FOR QUEENSLAND—SYDNEY SHOW PURCHASES.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

A further selection of Stud Pigs for the Department of Agriculture and Stock, Queensland, was made at the Royal Show Sales, Sydney, recently. On this occasion the highest priced animal was a yearling Berkshire boar for the State Farm, Warren. He was secured at 37 guineas and represents the very best blood available in this old English breed.

The boar, "Newington Masher" 6613 by name, was bred at the State Hospital, Newington, N.S.W., was farrowed on 3rd May, 1924, is sired by "Poligate Masher" 4791 (a champion from Western Australia), and is from "Newington Violet" 4148. It is hoped to publish a photograph of this boar in our next issue, as he should prove a distinct acquisition to the Berkshire blood in this State. "Newington Masher" won second prize in a keenly contested class at Sydney Show—a class in which no fewer than eleven boars competed. A quartette of high-class Tamworth pigs from the State Farm, Kairi, North Queensland, comprised the balance of the Agricultural Department's purchases. In this case the boar "Blakeney Sandy" is a son of the imported Tamworth boar "Kingsnorton Sidney" (imp.) 315 by "Knowle Maxman" N.B. 36023 from "Kingsnorton Nicest" N.B. 76140. He secured second prize in the class for boars under six months old. The first prize boar, "Orara Skipper," being secured for the Gatton College stud.

The Tamworth sows secured for Kairi were "Orara Goldleaf" (first prize sow under six months old) and "Orara Gilt," both daughters of the champion sow (see Plate 76) "Manning Elnora" 243, both being sired by "Orara Goldstream" 251, the second prize boar in the class for boar over fifteen months old.

These young sows are of exceptionally good quality and were considered by the vendor, Mr. C. J. Frank, of Coramba, N.S.W., to be the pick of the young sows he had available at his stud from the champion sow; this latter sow was bred by Fred. S. Martin, of Burrellbruh, N.S.W., the breeder from whose stud Mr. Frank made his original purchase when forming the nucleus of the high-class stud he possesses to-day. The third sow was also a daughter of the imported boar "Kingsnorton Sidney," and she secured second prize to "Orara Goldleaf," the sow referred to above. These four pigs form the nucleus of the new Tamworth stud at the State Farm, Kairi, and it is intended to make their progeny available to the farmers of the Atherton Tableland at reasonable prices. There is a rapidly increasing inquiry for pigs of this fleshy type, for crossbreeding with the Berkshire and similar strains, and for the production of the early maturing meaty bacon so much in demand in these days. A number of purchases were made for the Gatton College Stud by the Instructor in Animal Husbandry (Mr. A. J. MacKenzie); these included Berkshires, Tamworths, and Poland-Chinas, all specially selected animals of the very best quality.

Purchases for Queensland Breeders.

The writer selected a very fine Berkshire sow, "Dundas Dora" 6628, bred by Charles Dawson, of Belmore street, Dundas, N.S.W., for Mat Porter and Son, of Roselock Stud, Wondai. This sow was in pig to the boar "Britannia Brigadier" 6466, a son of the famous old champion boar "Wilcannia Special" 3709, also a champion prize winner at Grafton Show, N.S.W. "Dundas Dora" was sired by "Dundas Carbineer" 5091, bred at the Parramatta Hospital, N.S.W., and is from "Dundas Sadie," the best sow in Mr. Dawson's herd; she is a daughter of that great old boar "Murray Pat" 3182, for which Mr. Dawson refused fifty guineas on several occasions. It is understood, also, that a couple of specially selected Berkshire sows were secured by Messrs. MacFarlane Brothers, of Radford, who are re-entering the stud pig business.

Mr. W. J. Warburton has also recently made several new purchases for his Berkshire and Yorkshire stud at Northgate Junction.

These several introductions should be of considerable value in the districts to which they go—districts specially suited for the raising of more and better pigs.

THE PIG SECTION AT SYDNEY SHOW.

By E. J. SHELTON, H.D.A., Instructor in Pig Raising.

From the standpoint of a Queenslander, the pig section had much to interest one, for "Pigs is pigs" in these days, and are destined to play a not unimportant part in the future development of this State. Sydney Show boasts the finest Pig Pavilion in Australia, an immense structure erected at a cost of more than £3,000,

yet it has been comfortably filled at every show since its erection, and is none too large for the increasing number of exhibitors who, with selected male and female stud pigs, find their way to the show each year. It is hoped the Brisbane Royal National Show authorities will carefully consider the erection of such a pavilion on Bowen Park Show Grounds, for such a building is urgently needed to house the exhibits coming forward to Brisbane Show each spring. Queensland is represented in the pig section at Sydney each year by that veteran exhibitor, Mr. W. J. Warburton, of Northgate, who this year eclipsed all previous records by securing both championships in the Middle Yorkshire section as well as numerous other awards. Mr. Warburton has travelled to Sydney each year with a truckload of pigs for close on twenty years, and is as well known on the Show Grounds there as he is in Queensland.

Berkshires hold pride of place in most of our show rings, both State and interstate, as well as at most country shows, and in point of numbers far exceed the other classes at Sydney. This year several well-known Victorian exhibitors were absent, notably Messrs. Crane and Bedwell, Stewart and Jenkins, all of whom have been eminently successful in former years. These breeders report excellent sales in the Southern State, and had but little stock left suitable for exhibition at Sydney. Competition was, nevertheless, very keen, and considerable interest was displayed in the judging of the various classes. Mr. George Dair, of Lilydale, Victoria, judged the Berkshires, and had no easy task, for many of the classes were heavily contested and the quality such as to make it exceedingly difficult to "pick the winners." The aged boar championship was annexed by the Kelburn Stud Pig Farm with an English imported boar "Suddon Sydney," brought out by Mr. A. J. Tanner at considerable expense three years ago. "Suddon Sydney" is, in the opinion of the writer, the most typical and the most fashionably bred Berkshire boar that has yet been seen at an Australian show. Coming as he does direct from one of the most noted English studs, that of Mr. J. A. Fricker, he carries a wonderful development of body and ham and a massiveness seen in but few of our Berkshires here. It is a pity the Sydney Show authorities refused to accept for competition the Empire Challenge Silver Cup for the best Berkshire boar, for "Suddon Sydney" would certainly have annexed this cup, which has already been inscribed with the name of the winner at Melbourne Show and his exhibit, Mr. H. Brewer's "Renrow Astronomer," Champion Boar at Melbourne Show, 1924, which boar unfortunately died in transit to the Sydney Show this year.

The female championship was awarded to G. R. Limbrick's "Conargo Topsy," a former champion, and an evenly developed matronly sow.

The Berkshire section always attracts considerable attention, but one does not see as many of the progeny of former champions as one would expect, though both the above sow and last year's champion Berkshire boar, "Murray Glen Star," now the property of Gatton College, were well represented by a number of evenly developed shapely animals.

The Large and Middle Yorkshires.

It is unfortunate that these beautiful white animals do not suit northern conditions nor market demands as well as the Berkshires, Poland-Chinas, or Tamworths, for they possess many very valuable qualities, such, for instance, as prolificacy—a characteristic lacking in many of our show animals—docility, early maturity, and trueness to type.

The Tamworths and Poland-Chinas.

Tamworths and Poland-Chinas made a record showing this year, their quality standing out in such a way as to attract the attention of breeders from every part of the Commonwealth. These two breeds have loomed large in public favour in recent years—the Tamworth as an ideal type for the production of fleshy bacon pigs, the Poland-China for early maturity, ease in handling, and an aptitude to lay on flesh rapidly on a comparatively small amount of food. The exhibitors in these sections, though fewer in number than in the other classes, made a showing of which the Society should justly feel proud. The Champion Tamworth Sow, "Manning Elnora," exhibited by Mr. C. J. Frank, of Coramba, N.S.W., was considered by competent judges to be the finest animal in this breed we have yet seen in our show rings. Her qualifications can best be judged by a close study of her photograph in this issue, page 426.

The Champion Tamworth Boar was the property of Rydelmere Mental Hospital, N.S.W.

The Large and Middle Yorkshire sections were of excellent quality and conformation. It was in the latter section where the Queensland exhibitor, Mr. W. J. Warburton, excelled.

There were but two exhibitors in the Duroc-Jersey and Gloucester Old Spot breeds; these breeds being new to breeders here, have not yet attracted the attention riveted upon the older established breeds, and it yet remains to be seen whether they will adapt themselves as well to Australian conditions as the other four breeds referred to above.

It was noted with considerable satisfaction that officials of the Royal National Association, Brisbane, were very busy at the Sydney Show; they visited the pig section, interviewed various breeders, and it is hoped induced a number of them to come forward with exhibits for the forthcoming Royal National Jubilee Show.

Reference is made on another page to the purchases made on behalf of the Queensland Government and private breeders here.

THE HIBERNATION AND PARASITISM OF A FRUIT FLY IN THE STANTHORPE DISTRICT.

By F. A. PERKINS, B.Sc.Agr., Stanthorpe and District Research Fellow, and G. H. HARDY, Walter and Eliza Hall Fellow in Economic Biology, Queensland University, Brisbane.

[*Through the courtesy of Professor E. J. Goddard, B.A., D.Sc., of the Queensland University, we are able to publish the subjoined account of an investigation into the subject of fruit fly parasitism.—Ed.*]

PART I.—THE DISCOVERY OF A FRUIT FLY IN THE WINTER AT STANTHORPE.

(F. A. PERKINS).

The chief problem in connection with the fruit fly investigation at Stanthorpe is to ascertain the origin of the flies that lay the first batch of eggs each fruit season. Until that is done the only controls that can be put into operation are the gathering and destruction of infected fruit, traps and lures, and poison bait sprays, all three of which are only applicable for a few months of the year. Any discovery which may throw light upon the whereabouts of the fly during the winter and early spring is consequently of importance.

About the middle of June, 1924, Mr. Townsend, of Severnleigh, found a tree which was heavily laden with small purple-coloured fruit. On examination he found that the fruit was infected by maggots resembling those of a fruit fly. He reported his discovery to the entomologists resident in the district, who made further investigations. The tree was situated in a sheltered gully, and was growing practically in a creek bed. It stood about 25 feet high and was bearing many hundreds of small fruit about half an inch in diameter. Each fruit contained a very large stone, the flesh surrounding it being less than one-eighth of an inch thick.

On examining the gully about twenty trees were found, only five of which were bearing fruit. Specimens of the fruit and foliage were submitted for identification to the Government Botanist, Mr. C. T. White, who replied that the tree was *Notelæa longifolia* var. *velutina*, which variety only differed from the normal form by having velvety pubescent instead of glabrous leaves. This small tree sometimes occurs in dense scrubs, but is more often found on scrub edges, in gullies, and in the so-called "bastard scrub." It ranges from North Queensland (Cairns district) to Victoria (Eastern Gippsland), but is never plentiful in any one locality. Mr. White also said that the main fruiting period is in December, but judging from his herbarium specimens, it seemed rather variable in this respect, and probably the fruits persist for some time.

Although a careful search was made throughout the district, *N. longifolia* was only found in three localities, each a sheltered gully, and very few of the trees bearing fruit.

On the 24th June, though a large quantity of fruit had fallen, a considerable amount was still hanging on the tree, and of the latter only a small percentage contained maggots. Of the fruit on the ground, the majority had been infested by maggots which had already left the fruit and pupated. An examination of the soil beneath the tree resulted in finding about 200 puparia, the majority occurring on a flat rock covered with half an inch of soil, overlaid with leaves. Some were found under several inches of sand, whilst others were mixed up with decaying

leaves and mould up to eight inches below the surface. Invariably the puparia were in moist conditions. Some of the puparia were a pale yellow, and they ranged in colour from this to deep brown and almost to black.

In the laboratory the maggots were carefully examined under the microscope, and could not be distinguished from the ordinary fruit fly maggots. As there are no known differences between the larvæ of the fruit fly (*Dacus tryoni* Frog.) and the Solanum fly (*D. tryoni* var. *solani*), the maggots found in the native fruit may have been the larvæ of either of these flies.

In order to try and verify this, a trap containing Harvey lure was placed in the tree, but failed to attract any species of fruit fly. The pupæ were sent to Brisbane to be incubated, as no suitable apparatus was available at Stanthorpe. A few puparia showing the exit holes of parasites were found. As the fruit of the host was very small and the larvæ of the fly compelled to work just beneath the surface, it was suspected that the puparia collected would be heavily parasitised. Such proved to be the case, for practically all collected and incubated in Brisbane contained parasites.

On the 29th July there was no fruit left on the trees at Severnleigh, but on examining the soil beneath the tree 150 puparia were obtained. As before, many empty puparia showing exit holes of parasites were found.

The fact of finding living larvæ and puparia of either of the flies mentioned above on the 24th June and the living puparia on the 29th July is most interesting. During the months of May, June, and July the following frosts were experienced:—

Date.	Number of Frost.	Maximum Degree of Frost.	Average Degree of Frost.
		Degrees.	Degrees.
May	15	17	8
June, to 24th	17	15	7½
June	20	15	7
July, to 29th	18	18	7

Evidently cold weather does not kill the larval and pupal stages of the fly. Apparently the adults had been killed or were no longer active, for at Severnleigh there was no fruit available other than that of *N. longifolia*, yet no Trypetidæ were attracted to the traps.

Of the puparia collected on the 24th June, sixty were retained in glass jars, together with a little soil, and allowed to develop under laboratory conditions at Stanthorpe. On the 29th September, three parasites emerged, and others continued to do so till the 4th November, when the experiment was discontinud. In all, forty parasites were obtained, and of the remaining pupæ six had been parasitised and fourteen were too decomposed to determine if they had been parasitised or not. Thus forty-six, or 76 per cent., of the puparia were found to be parasitised.

It is still doubtful if the fly found attacking *Notelæa longifolia* is the Queensland Fruit Fly or the Solanum Fly, but, which ever it be, considerable light has been thrown on the manner in which the species persists through the winter, and if the latter, then *N. longifolia* is the first host plant known to harbour that variety in the Stanthorpe district.

PART II.—THE RESULTS OF INCUBATION TESTS.

(G. H. HARDY.)

In order to hasten the emergence of flies and parasites from the puparia of the fruit fly found to have infested the fruits of a native tree at Stanthorpe, a number were matured at the Queensland University, where three suitable incubators had been constructed for investigations in connection with the solution of certain blowfly problems. There was considerable doubt with regard to the method that should be utilised in order to successfully breed these flies under the artificial conditions of incubation. The temperatures of the incubators could not be altered except at the expense of the experiments on the blowflies that were already in progress, and therefore three temperatures only were available for testing purposes. Also apprehension was expressed lest breeding under dry conditions, though successful with

the hard puparia of blowflies might be detrimental to those of the more delicate fruit flies. When damp conditions are used in connection with incubation, mildew and general rot are very easily induced by the artificial atmosphere so created. The first two experiments with the fruit fly puparia were therefore of an experimental nature, and only the third one showed decisive results in connection with the investigation.

Another factor that had to be considered was the total elimination of foreign animal or vegetable matter from the soil used in the incubators. Fungoid infestation, bringing about the failure of an incubation test, is often traceable to this source. The use of the soil from which the puparia were originally extracted, and which at first sight appears to be the most promising medium to use, had to be discarded as being too dangerous for the purpose. Instead, the puparia were buried in clean sand, and with those experiments in which damp conditions were tested the water was boiled and allowed to cool. Details concerning each consignment of fruit fly puparia subjected to the incubation test are given below.

Consignment No. 1.—Thirty-one pupæ received on the 25th June were placed in incubators at the following temperatures:—13 at 75 deg. Fahr.; 12 at 65 deg. F.; and 6 (that, owing to the manner in which they were packed, had become damaged in transit) at 88 deg. F. These produced only parasites which emerged as follows:—

Males.	Females.	Date of Emergence.	Number of Days Incubated.
		Subjected to 75° Fahr.	
1	..	July 11th	16
..	1	July 15th	20
2	1	July 16th	21
..	1	July 18th	23
		Subjected to 65° Fahr.	
..	1	July 18th	23
..	..	July 22nd	27
1	..	July 22nd	27
2	..	July 24th	29
..	2	July 28th	33

On the 16th July, when it became evident that the puparia placed at 75 deg. F. were producing parasites favourably, those originally placed at 65 deg. were transferred to this incubator in order to hasten their development. The puparia from which no insects emerged were eventually opened, but most of them had their contents in a state of putrifaction, and those of only two (both from the batch originally placed at 65 deg.) were determinable; one contained a dead fruit fly, the other a dead parasite. The puparia placed at 88 deg. failed to produce insects, mainly owing to their damaged condition, and were found to be in a state unsuitable for the determination of their contents.

Consignment No. 2.—Thirty-one puparia received on the 8th July were distributed as follows:—7 at 88 deg., 14 at 75 deg., and 10 were retained until the 16th July. Already it had been ascertained that 75 deg. was a temperature more suitable for development than the 65 deg., but it was considered advisable to test the efficiency of the incubator at 88 deg.; on this account ten pupæ were retained

until results justified their use. As in the previous consignment, only bracons emerged.

Males.	Females.	Date of Emergence.	Number of Days Incubated.
		Incubated from the 8th July.	
1	1	July 24th	16
1	1	July 28th	20
2	2	July 29th	21
..	1	July 30th	22
		2 sex (?) escaped.	
		Incubated from the 16th July.	
..	1	July 29th	13
1	..	July 30th	14
1	..	July 31st	15
..	2	August 1st	16
..	2	August 2nd	17
..	1	August 3rd	18

All the puparia placed at 88 deg. F. died; the contents of five consisted of well-developed parasites, and two did not advance sufficiently far to indicate if they also had been parasitised. Of the remainder, two dead puparia produced parasites, one a dead fly, and two were doubtful, as they, too, had died in an early stage of development.

Consignment No. 3.—Received on the 2nd August; was placed in the incubator at 75 deg. F. on the 4th.

The puparia of the first consignment were given damp sand wherein to develop, but it was found that the contents of those that died were too putrefied for determining whether they consisted of flies or wasps. On this account the puparia of the second consignment were placed in dry sand, and the emergence of the parasites were more favourable than those of the former group; this, however, might have been due entirely to the better condition in which the puparia were received. The contents of those that had died under the dry conditions of the experiment were usually determinable, thus a more satisfactory conception of the effect of the parasitism was obtained than could otherwise have been achieved. The third consignment, therefore, was treated under dry conditions in the incubator at 75 deg. F., which had proved the most efficient of the three temperatures available.

Puparia, if opened soon after formation, will be found to contain a creamy liquid, in which the germinal buds of the fly are floating. As development proceeds the shape of the fly forms, and should a parasitic larva also be contained in the puparia, this begins to grow to a visible size, so that when the fly is moderately well advanced the parasite is also to be detected. Should the parasite die at an early stage, it might be readily overlooked, as the fly develops a little further before dying itself. There was no case found of a fly showing signs to be deduced as having reached a development under these conditions, but several larvæ of the parasite had attained the final instar, leaving very meagre remains of its host, and three had even reached the pupal stage, but most of these braconid wasps that had died in the puparium were of the adult form with their red, black, and white colours practically complete. The pupa of the wasp showed the ovipositor of the female quite distinctly, hence the sex of such could be readily determined when the parasite had not been damaged in the process of opening the puparium.

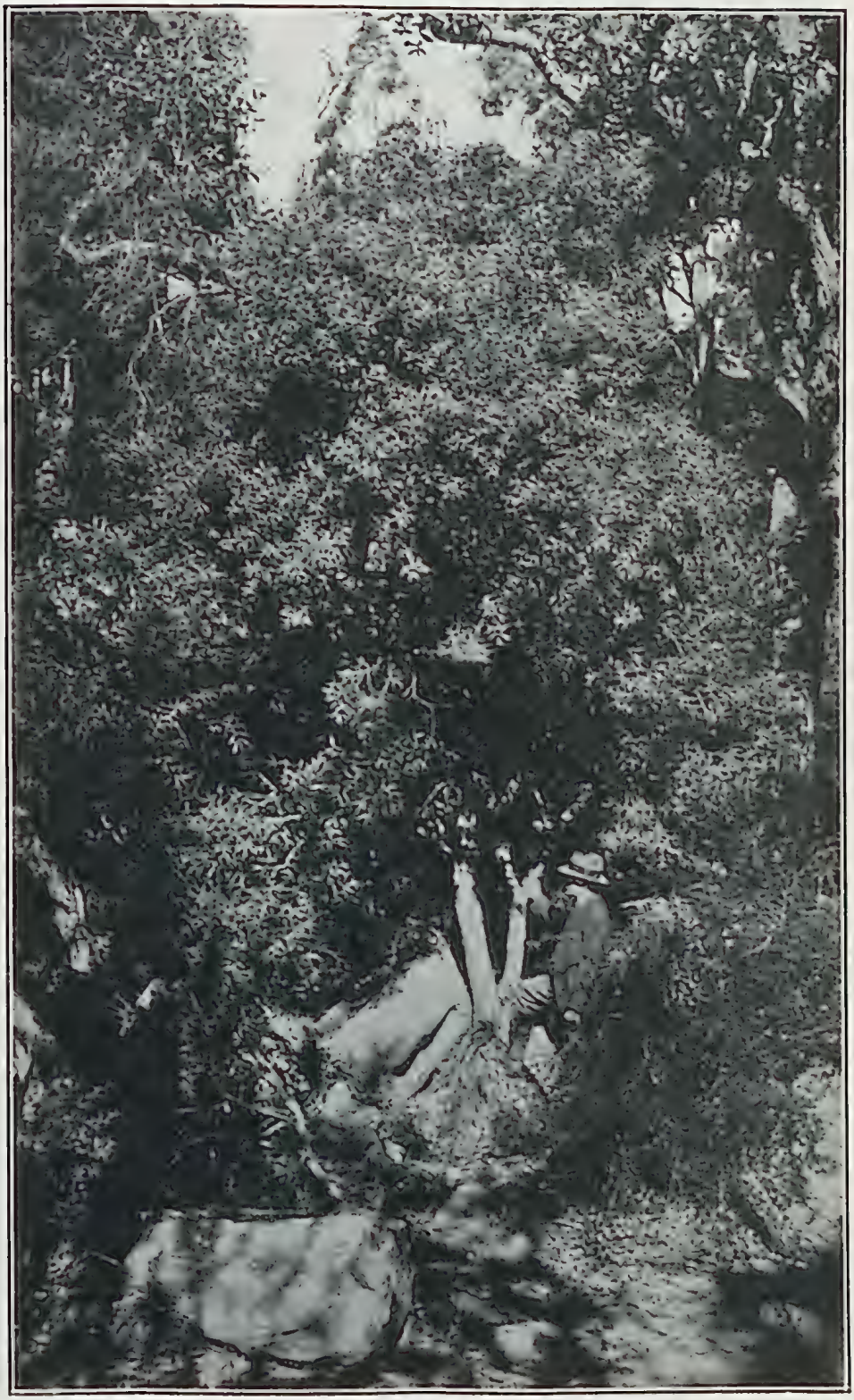

Photo. J. Henderson.

PLATE 80.—THE SOUTHERN OLIVE (*Notelœa longifolia*, var. *velutina*).

Five puparia had died very early in their development before the shape of the fly could form, and the contents had shrunken to a small space. In such cases no particulars were able to be ascertained with regard to whether they had or had not been parasitised. From this, the third consignment, as in the previous cases, only *Diachasma* emerged.

Males.	Females.	Date of Emergence.	No. of Days Incubated.
2	..	August 19th	15
3	..	August 20th	16
4	..	August 21st	17
9	2	August 22nd	18
6	3	August 23rd	20–21
9	17	August 24th-25th	21–22
2	1	August 26th-27th	22–23

Photo J. Henderson.]

PLATE 81.—LEAVES AND FRUIT OF THE SOUTHERN OLIVE.

The three batches of puparia subjected to 75 deg. F. soon after they were received produced parasites with remarkable consistency in regard to the number of days they required to mature, being 16-23, 16-22, and 15-23 days respectively. The one case where eight days were allowed to elapse between the receipt of the puparia and their insertion into the incubator, the bracons resulting from it required only 13-18 days to reach maturity at 75 deg. F., which suggests that the wasps had developed considerably under the influence of the Brisbane winter, and would not hibernate there as they were doing at Stanthorpe.

The contents of the dead puparia disclosed one dead fly and five that had died in a stage too early in development to show if they had or had not been parasitised. Further particulars are included in the following table:—

——	Males.	Females.	Sex. (?)	Total.
Parasites—				
Emerged	36	24	..	60
Died as imagos	20	8	3	31
Died as pupa	1	1	1	3
Died as larvæ	..	..	6	6
Puparia—				
Total parasitised	..	..	..	100
Total unparasitised	..	..	..	1
Total undetermined	..	..	..	5
				106

A Test on Unparasitised Fruit Fly Puparia.—Of the three batches of fruit fly puparia, details of which are given above, a percentage were found to be either unparasitised or doubtfully so. There remained, therefore, the necessity to determine if the flies had failed to emerge owing to the conditions of incubation. Neither the temperature nor the dry conditions of the experiment had yet been tested for the emergence of the flies themselves, and it may reasonably be argued that had conditions been otherwise the flies might have survived.

Larvæ of fruit flies, found breeding in Brisbane on *Solanum auriculatum* under conditions that rendered them free from their parasites, were gathered and their puparia were subjected to the same incubation test as those of the third consignment received from Stanthorpe. The flies emerged as follows:—

Number of Flies.	Date of Pupation.	Date of Emergence.	Number of Days Incubated.
2	August 6th	August 21st	15
2	August 7th	August 23rd	16
11	August 8th	August 24th	16
14	August 9th	August 25th	16
11	August 10th	August 25th	15
10	August 11th	August 26th	15
2	August 12th	August 27th	15
1	August 12th	August 28th	16
1	August 13th	August 28th	15

At 75 deg. F. twenty-six flies emerged in 15 days, and twenty-eight of them in 16 days. Four puparia died before they had reached a stage sufficiently far advanced to show the developing fly therein, and three died when this progress had become pronounced.

That only seven puparia died out of sixty-one placed in the incubator is decisive evidence that neither the temperature nor the dry conditions of the experiment were detrimental to the development of the fruit fly, and that had there been any living and unparasitised puparia in the various consignments received from Stanthorpe, these should have had an excellent chance of emerging.

Conclusions.—From these tests it is reasonable to conclude that the activities of the parasitic wasp, *Diachasma tryoni* Cameron, have made it probable that only a very small percentage of the flies which have been breeding in the fruit of *Notelœa longifolia* in the Stanthorpe district could have survived the winter, initiating the first generation to attack fruit, whether native or cultivated, in the following season.

General Notes.

A Goodna Sanctuary.

The grounds of the Mental Hospital at Goodna have been declared a sanctuary for the protection of native animals and birds.

Sugar Assessment.

An Order in Council has been approved, declaring that the assessment which the Minister for Agriculture may make and levy on every ton of sugar cane received at any sugar-mill on and after the 17th April, 1925, shall be fixed at the sum of 2d. per ton.

Crow's Nest a Tick Cleansing Area.

Portion of the Crow's Nest district has been proclaimed a Tick Cleansing Area. It is really an extension of the present Helidon Cleansing Area in a north-westerly direction to the Blackbutt Range and includes Haden and Djuan. It will act as a further buffer area for the Darling Downs, thus affording extra protection to stock-owners on the western side of the Main Range. Stockowners in the new area for some time past have been most anxious to have this action taken.

Staff Changes and Appointments.

Mr. A. P. Devereux, of Amiens, has been appointed a Temporary Inspector, Diseases in Plants Acts, for a period of six months.

Constables J. J. Houlihan and M. Talty, of Tangorin and Rosedale, respectively, have been appointed Inspectors of Slaughter-houses.

Mr. P. J. Carseldine, of Bald Hills, and Mr. T. J. Leonard, of Lake Manchester, have been appointed Inspectors under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. H. H. Young as millowners' representative on the Fairymead Local Sugar Cane Prices Board has been accepted and Mr. C. E. Young appointed in his stead.

Messrs. A. N. Burns and R. W. Mungomery have been admitted to the Public Service and appointed Assistant Entomologists, Sugar Experiment Stations, Department of Agriculture and Stock.

Experimental Farms—Do they Pay?

The following observations, taken from a publication of the Canadian Department of Agriculture, are interesting:—

"What is meant by 'pay'? Surely no thoughtful man expects an experimental farm to return a cash profit each year over and above its yearly expenditure. These farms are *experimental* not *model* farms. Many lines of experiment yield no tangible return—they simply supply information sought for; not every experiment is a success—often the result obtained therefrom is negative, *i.e.*, a certain crop or method cannot be used with success under certain conditions. Again the work of research underlying and preceding experiment, the planning of the latter, the collection and interpretation of results, the preparation and issuing of these results in the form best suited to the needs of the farmer, are large items in the cost of operating the experimental farms, items which the cash returns from the farms themselvs cannot be expected to cover.

"The term 'pay,' however, should be regarded as having a wider meaning. The Experimental Farms Branch is an institution of service for the Canadian farmer. To him, results obtained are transmitted through various channels for his use and benefit in his practical everyday farm operations. The sum total of this benefit, in the sense of increased production of higher quality products, is the true indication and test as to whether experimental farms 'pay' or do not 'pay.' This benefit cannot be totalled up in dollars and cents for the whole Dominion. In much of the farms' work, it is difficult to point out and name specific achievements—the work has been simply that of gradual improvement in certain farming practices and the accumulation of information to guide and stimulate better farming."

Atherton Maize Board.

The Atherton Tableland Maize Board has been given power by His Excellency the Governor to, out of its funds, make advances to growers in respect of their crops of growing maize, upon such security as the Board may think fit.

Peanut Board.

As no petition has been received asking for a poll to be taken in connection with the proposed Peanut Board, a new Peanut Board has now been created to deal with peanuts harvested from one-half acre and upwards in Queensland from the 1st July, 1924, to the 30th June, 1927. The board will consist of four members, one to represent the Council of Agriculture and three elected by growers. Until the 31st August, 1925, the Board will consist of the following persons:—

To represent District No. 1 (Petty Sessions Districts of Wienholt and Nanango), C. F. Adermann and Wm. Muir.

To represent District No. 2 (rest of Queensland), R. M. Wise.

To represent Council of Agriculture, Wm. O'Mara.

Chairman, C. F. Adermann.

After the 31st August, 1925, two members shall be elected to represent District No. 1 and one to represent District No. 2. Such members, together with the representative of the Council of Agriculture and the chairman, shall hold office for one year from the dates of their appointments.

Persons deemed to be growers of peanuts and eligible to vote on any referendum or election in connection with the said Board shall be persons who have had growing peanuts on areas of one-half acre and upwards at any time during a period of twelve months prior to any referendum or election held between the 1st July, 1924, and the 30th June, 1927.

Proposed Egg Board.

A notice has been issued declaring the intention of His Excellency the Governor to create a new Egg Board to be in operation from the 1st June, 1925, to the 31st May, 1928. The board will consist of five persons elected by growers and one to represent the Council of Agriculture and will apply to that part of Queensland lying east of a straight line drawn from Bundaberg to Goondiwindi. Persons deemed to be producers and eligible to vote in connection with this board will be—

Persons owning or keeping one hundred or more domesticated fowls.

Each member of a partnership or family which collectively owns or keeps one hundred or more domesticated fowls.

Owners of 100 fowls will be required to register their premises with the Board not later than the 1st August in each year. Provision is also made for the appointment by the Minister of an officer of the Board to inspect and take copies of any books, vouchers, or other relevant documents held by any owner in connection with his fowls. The Board will be empowered to make a levy or levies upon owners of 100 fowls to provide for poll and other incidental expenses, provided that, before a levy is made, the growers concerned are given the opportunity of voting as to whether or not they favour the levy being made. In connection with a poll, members of a partnership or family which collectively owns or keeps 100 or more domesticated fowls will only have one individual vote and will be required, not later than fourteen days after the notice of intention to make the levy has been issued, to nominate one member of the family or partnership respectively to exercise that vote.

The class of persons who shall be deemed to be producers may, at any time, by Order in Council, be extended to include persons who own or keep less than 100 domesticated fowls, but notice of intention to do this must first be published and growers owning fewer than 100 fowls will, if necessary, be asked to record their votes in expressing their wishes in the matter. Before a poll is held, however, a petition signed by fifty producers must be received by the Minister for Agriculture.

In order to ensure their names being on the roll of persons eligible to vote on any matters in connection with the proposed Egg Board, persons who on the 31st March, 1925, owned or kept 100 fowls or more, are invited to send their names and addresses to the Under Secretary, Department of Agriculture and Stock. Any petition for a poll to decide whether the proposed Board shall be created must reach the Minister before the 22nd May, 1925.

Nominations are being called for election for one year as Producers' Representatives on the proposed Board. Five representatives are to be elected by producers as already defined, one representative for each district, the districts being the same as those used for the previous Egg Board. The closing date for the receipt of nominations is the 18th May, 1925.

The Benefits of Green Manuring.

Green-manuring benefits the soil in two ways. It enriches the soil in the first place, by supplying it with a considerable amount of readily available plant-food, and in the second place by adding humus, and thus improving the soil's texture and its power of absorbing and retaining moisture. When a manure crop is buried, the surface soil becomes enriched by the nourishing materials which the crop during the period of its growth had drawn from the air and from the lower portions of the subsoil, and this material is now placed within the reach of the succeeding crop.

During the growth of the plant the soil has, in addition, been stirred up and disintegrated by the development of the roots. When ploughed under, provided sufficient moisture and warmth are present, the buried mass decomposes with more or less rapidity.

A further important result is the formation of carbonic acid by the decomposition of the buried crop. Carbonic acid is given off abundantly in the fermentation of the mass, and assists in the disintegration of the soil and in rendering available the plant-food contained in it.

Green-manuring is effective both in sandy and on heavy clay soils, and indeed on all soils deficient in humus. On sandy soils the effect of green-manuring is to consolidate the soil, the humus formed binding the particles together. On clay soils, the effect of the addition of humus and the production of carbonic acid is to loosen and aerate the particles. When conditions as to warmth and moisture are favourable, and the crop decomposes fairly rapidly, the production of soluble plant-food proceeds with considerable rapidity. This is especially the case in respect of nitrogen, which is the principal manurial ingredient. Nitrification (that is, the conversion of the nitrogenous material of the plant into soluble nitrates) takes place quite rapidly. In sandy soils, green manure nitrifies more rapidly than manures like dried blood, bonedust, &c., and only less slowly than ammonium sulphate; while in stiff clay soil the green crop nitrifies very much more rapidly than either sulphate of ammonia or animal manures.

Animal Manure Values.

Of animal manures, each has its particular utility, but availability is a big consideration, and use must be made of whatever kind is handy, for all are more or less of value in the growing of vegetables.

Horse manure is drier than most manures, and for this reason it acts most quickly and is most efficient in the raising of early crops. As a winter manure it is most valuable.

Cow and pig manures are of a heavier nature, decomposing more slowly and being therefore slower in action. They are good moisture-holders, and are therefore very valuable during the summer.

Sheep manure is fine-textured and very concentrated, and is therefore of great value in the vegetable garden. Unless care is exercised, however, weed seeds may inadvertently be introduced with it.

Poultry manure is the most concentrated of all animal manures, and on this account it must be applied with discretion. If dry sand is scattered regularly on the floor of the fowl-house, the droppings will be drier and therefore more suitable for spreading on the surface of the soil. If fresh poultry manure is used, it should be raked or lightly dug into the surface of the soil or applied in the form of liquid manure. If it is intended to dig it into the soil, it should be allowed to rot in the compost heap.

To make liquid manure, soak a sugar bag of fresh poultry, cow, or pig manure for a week in a cask with the head knocked in—one holding 40 to 50 gallons is the most handy. Use the resulting solution at the rate of one part to three parts of fresh water. Fill the cask again, and when the manure has soaked for a week use the solution at the rate of one part to one part of fresh water. The cask may then be filled up a third time, and after the liquid has been allowed to stand for a week it may be used neat. This form of liquid manure is safe, and if it is applied weekly at the rate of 4 gallons to every 18 feet of a running row no further stimulant is necessary for most growing crops.

Many crops, such as lettuce, cabbage, and silver beet, will be more tender for being forced by applications of liquid manure.

Do not apply liquid manure to plants if the soil is at all dry. Dry soil should first be watered.

Utility Poultry Show in June.

Something new to Queensland is to take place on Wednesday, 3rd June (King's Birthday), viz., a purely utility poultry show. The N.U.P.B.A. is responsible for the innovation.

Numerous shows have included utility sections in their schedules, but it will be the first occasion on which all the birds in the show will be judged on their utilitarian qualities.

The show will be held at Petty's Paddock and the secretary has already received a large number of entries and promises of support. Schedules are obtainable from the Royal National Association, N.U.P.B.A., Co-operative Society, and the secretary, Zillmere.

A feature of the show will be a non-competitive exhibition of birds which have laid over 300 eggs in public competitions in Queensland, and these should draw a large crowd of people who have never previously had the opportunity of inspecting these aristocrats of the poultry world.

Wintering of Bees.

For good wintering of bees the essential points are:—

(1) A good vigorous queen to obtain the necessary force of young bees.

(2) Good brood combs in the brood nest.

(3) A good hive which allows comfort for the bees during the cold weather.

(4) A good quantity of good stores; for a fair-sized colony not less than one full ideal super, plus what is naturally contained in the brood nest.

In this mild climate there is not much done toward preparation for winter; nevertheless a little more trouble should be taken than is usual, and the results would well repay the apiarist. Here is one point: At the close of the season remove those empty, or practically empty, supers, and allow the colonies to be compact. It is quite a usual practice among apiarists to leave all the supers on the hives during winter, and as generally there are a few empty ones, the same comfortable conditions are not obtained as where the colony is compact and the stores convenient.

Housing of Pigs.

For quick returns and for the utilisation of farm products which otherwise would be of little marketable value, pigs stand alone. An intelligent interest in their wefare is necessary, however, if the best results are to be obtained, and of the first factors in the welfare of pigs as of any other stock is good housing. Following are the essential requirements in a sty:—

1. Sties should, if possible, face the north or east, so that they will get the full benefit of the sunlight. Sunlight is a most efficient germicide, and is a great help in keeping the sties sweet and sanitary.

2. Sties should be built on rising ground, to ensure good drainage. This does not necessarily imply that they should be placed on the top of a hill, where the animals would be exposed to every wind that blows.

3. The roof should be sufficiently high to admit of the sty being cleaned easily. The idea of keeping a pigsty clean is revolutionary to some farmers, but disease and filth are associated as a rule, and cleanliness is essential to the preservation of health.

4. The walls should be smooth, so that there is no harbour for animal parasites. On this account walls of split bush timber are objectionable.

5. Allowance must be made to admit plenty of sunlight and fresh air.

6. The walls must be impervious to the wind, so that the sty is not draughty.

7. The floor should be impervious to moisture. The common custom of allowing the pigs to sleep on the earth, while doing away with the necessity of bedding, has much to condemn it. The earth is easily rooted up, is damp and cold in winter, and is soon saturated with filth. Concrete makes the most sanitary floor, but as it is cold and hard, a sleeping platform of wood is necessary with it. If this is made sufficiently light it is easily removed for purposes of cleaning the sty. A floor made of hardwood, well joined and raised above the ground level, is quite satisfactory; but floors made of slabs laid on the ground are little better than the earth itself.

If the points enumerated above are attended to the pigs will have dry, clean housing in favourable situations, free of draughts and yet with abundance of fresh air.

Stove when Stumps Burn Badly.

Despite the rather frequent expression of views to the contrary, neither saltpetre nor any other chemical is of any value in assisting the burning of stumps. The best way to deal with a stump that burns badly is to "stove" it—*i.e.*, build a good pile of logs and brush around it, fire in the ordinary way, and cover the burning material, when well alight, with clay. Such a fire will smoulder for some weeks, and will gradually destroy the stump.

Profit from Fruit—Quality plus Appearance.

With later varieties of apples and pears harvesting will still be in progress. To secure the best results fruit should be carefully picked, handled, and packed. It is important to place upon the market only such fruit as is in prime condition and of attractive appearance. The buyer is usually very critical. He sees a great range of fruit, and he knows that he who places the best before the consumer—best in quality and in appearance—has an immense advantage over vendors who are careless in such matters.

In this connection it may be remarked that wrapping fruit helps to preserve it and enhances its aspect. A clean case with well-graded well-packed fruit, with an attractive label, makes a strong appeal to the most fastidious buyers. Some carters injure the appearance of cases by walking over them, and it is sometimes further detracted from by the cases being packed in dirty unswept trucks. Wiring of cases is strongly recommended, particularly when they are made of soft wood and intended for export. The best results are obtained by placing the wires about 1¾ inches from each end. Wires so placed will greatly minimise the loss by pillage and damage.

Maize—Its Australian Future.

On the subject of the future of maize-growing Australia, Mr. H. Wenholz, B.Sc. (Agr.), of New South Wales Department of Agriculture, delivered an instructive lecture at the Royal Show, Sydney, at Easter.

The lecturer said it may be doubted by some whether maize-growing had any future possibilities of the good returns which have been associated with it in the past. Increased areas and good seasons in recent years had combined to bring about such a position that production had overtaken demand, and the market price had been greatly disturbing the growers.

Three means whereby the farmer might individually combat these low prices were worth consideration. The first of these was the greater utilisation of maize by stock. In the United States of America 90 per cent. of the huge annual crop of 3,000,000,000 bushels never leaves the farm on which it is grown.

A unique opportunity, the lecturer continued, existed at the present time for Australia to develop pig-raising for the export of bacon and hams. Great Britain imported annually £46,000,000 worth of pig products, of which Australia's share was a modest £92,000 worth. America, which was one of Britain's suppliers, was suffering one of the shortest maize crops in the recent years of her history, and does not consequently anticipate much exportable surplus of her pig products.

The drought feed value of maize for sheep was well recognised in Australia, but its use for topping lambs and for lambing ewes was not yet appreciated to its extent in other countries.

America fed annually 40 per cent. of her huge crop of maize to dairy cattle, because of its high value for milk production, and an extension of its use in this direction in Australia was well worth consideration.

The utilisation of more maize for fodder or silage when grain was cheap would be found to increase effectively, though indirectly, the value of the crop, and its utilisation through the more profitable channels of stock entailed an extension of the stock carrying practice on the farm and involved more efficient methods of storage of the grain for which there was much room for improvement throughout the country.

With an extension of stock raising and more efficient storage methods and systematic means of increasing the yield by the application of proved results, the maize-grower could render himself much more independent of the low prices which existed at present.

The chief means whereby the yields of maize could be definitely increased, such as improving the soil fertility, the use of the best varieties, and methods of seed selection, and by improved cultivation methods was dealt with by the lecturer in detail.

Water for Bees.

The bee-farmer should generally endeavour to get near a permanent water supply when selecting a site for his apiary, for bees require an ample supply of good water, especially during the hot weather. If there is neglect in making provision for water near the apiary, there is considerable wastage of energy on the part of the bees in searching for a supply, and in carrying it a long distance.

It is not a very difficult matter to provide a water supply even if containers have to be used. A container offering a good surface of water is preferable, and cork floats can be put in the vessel to prevent the bees from being drowned. Another method is to bank sand in each side of the vessel, and place a cover over the water which is in the centre; the bees will obtain the water from the moist sand. It is important that the water supply be kept fresh.

A supply of water in the apiary grounds is especially advisable where bees are kept in towns, so as to get the bees into the habit of obtaining water at home, and not searching about the neighbours' homes for a supply.

Impure Sudan Grass—Its Effect on Live Stock.

A few weeks ago a report was published in the city Press that cattle had been poisoned by eating Sudan grass at Wellington. As Sudan grass is a decidedly useful fodder that is increasing in favour with owners of cattle in all parts of the State, the matter was investigated at once, and it was found that in both instances in which poisoning was reported to have occurred young sorghum and sorghum-sudan hydrids were very plentiful, and as the young growth of both kinds is very poisonous there could be no doubt that they were the cause of the deaths.

A number of these plants were collected and submitted to the chemist of the department for analysis, and in every case he found present in large quantities the glucocide that, on decomposition, produces prussic acid.

For some years past warnings have been addressed by the department to farmers against sowing impure Sudan grass seed, and not only have seedsmen been prosecuted under the Agricultural Seeds Act for selling seed of that class, but farmers have been asked to send in samples of seed for examination prior to sowing. The co-operation of all farmers and seedsmen is sought by the Department in clearing up the areas of impure seed, as without that co-operation isolated cases such as those which occurred at Wellington are certain to continue.

All growers of Sudan grass should make certain that their seed is pure. The Department is doing its utmost to supply the demand for pure seed, and growers should be content to purchase enough for 1 or 2 acres to begin with (6 to 8 lb. of seed is sufficient to sow an acre), and from that they should work up a stock of seed for sowing larger areas and also for sale purposes. As sorghum-cross fertilises very readily with Sudan grass, pure seed areas should not be in close proximity to a paddock of sorghum, because if the two crops are flowering at the same time, hybrid plants, which are poisonous in their young growth, will result from the seed of this cross..

As showing what deadly effects these young sorghum and sorghum-sudan hybrid plants have on milking cows, Mr. S. J. Matthews turned ten cows on to young growth at Wellington, and within ten minutes seven were affected. Their muscles became rigid, and five of the animals went down; two of the animals died.

Mr. Matthews had grazed Sudan grass in previous years, and no ill effects had resulted. When the sorghum and hybrid plants were pointed out to him, he stated that he had not noticed them in previous years.

Mr. James Zaia, in order to save his crop from grasshoppers, also turned his cows on to young growth, and within ten minutes seven cows out of eleven were affected. He lost three cows out of the seven. More sorghum plants were present in this area than in Mr. Matthews's crop.

Sudan grass has a very open head, fine stems, and narrow leaves. Most varieties of sorghum have compact heads (with the exception of varieties such as Early Amber Cane and Honey), coarse, thick stems, and broad leaves. The hybrid plants vary considerably in size and appearance, but in their young stages of growth generally stool very freely, their stems being much coarser and leaves broader than Sudan.

Sorghum and sorghum-sudan hybrid seeds are more or less rounded in shape, whereas Sudan seed is flatter, more elongated, and somewhat pointed at the ends.

The article is accompanied by valuable illustrations of the differences in seeds and plants.—"Agricultural Gazette" of New South Wales.

Wilt Resistant Tomato Seed.

Mr. J. T. Moore, of Bell's Gully, Bowen, who was mentioned by Mr. N. A. R. Pollock in the course of his recent notes on wilt resisting tomatoes as having seed for disposal, advises that he has now sold out of all seed from last year's crop. The new crop should be ready in the ordinary course about June next. Mr. Moore will then be able to satisfy all demands.

Fodder Crops for Dairy Cattle.

It is universally admitted that to obtain the best results from dairy cattle careful consideration must be given to the feeding. Good pastures, of course, are indispensable, but no matter how good they may be there are times during the year when they are not sufficient. It is then that fodder crops, either in their green state or in the form of silage, become essential to the maintenance of the milk flow and of the condition of the animals. As a matter of fact, more extensive feeding by the dairy farmer would be a profitable undertaking even when grass is at its best. The land returns a greater abundance of food when cropped than when under grass, and with the high prices that are ruling at present farmers should seriously consider how the carrying capacity of their farms might be increased. Further, green crops are extremely useful in providing a cheap feed for pigs and this alone would make cropping profitable.

Planting Fruit Trees.

Where deciduous fruit trees and vines are to be planted this season, it is preferable to start the work as soon as possible, provided the soil is in good condition. The early root growth, which starts long before the trees shoot in spring, then has an opportunity of doing so in the permanent position, whereas if planting be delayed the growth takes place in the nursery, and is wasted when the tree is transplanted later. If the soil is very dry, however, it would be better to defer planting until after rain has fallen.

The ground should be well prepared, and sufficiently early for the soil to have time to "sweeten" by exposure to the influence of the sun and air before planting. The depth to which a tree is planted is important. Planting too deeply sometimes results in stunted growth, and even in loss of the tree. The tree should be planted at about the depth at which it was growing in the nursery.

Before planting, the roots should be examined closely, and all bruised or broken roots cut away with a sharp knife or pruning shears. It is not necessary to leave roots longer than from 6 to 8 inches on the young tree. The hole should have a mound or crown in the centre, so that the roots may be spread in their natural position with a downward tendency, and the soil well worked in around them. The latter can easily be done by quickly raising and lowering the young tree an inch or two while the soil is being replaced in the hole, after which it should be firmed and loose soil thrown over the top. It is not advisable to plant while the soil is sticky, but rather when it is damp and friable.

Care should be taken to keep the roots covered with a moist bag to prevent their being dried out by wind or sun while planting is in progress.

After planting, the young trees should be cut back to within 12 to 18 inches of the ground, and if at any time the sun is hot enough to burn the trunks of the small trees, they should be protected by wrapping them with hessian or sacking, or protecting them with palings or anything which will prevent the sun from damaging them.

The practice of cutting back the young deciduous fruit tree when it is planted is generally advantageous. Cases have been noted where a tree has made satisfactory growth during the first season after planting when it was not headed back at planting time; but as a general rule trees treated in such manner make a very poor start the first season compared with those that are headed back when planted. It must be remembered that much of the root that has formed the top when the tree was growing in the nursery is lost when the tree is transplanted, and also that the part of the root that is retained has to become established in its new position before it can commence to function. It would, therefore, hardly be reasonable to expect this part of a disturbed root to support all the top that has been formed by a full root, and simultaneously to make satisfactory new growth.

Fruitgrowers are sometimes disposed to be too uncritical of young trees supplied by nurserymen. Each young tree received should be carefully inspected for any disease, and any that are spindly and poorly developed, and apparently unlikely to develop into sturdy individuals, should be unhesitatingly rejected. No honest nurseryman, jealous of his reputation, would wish to foist such trees upon the fruitgrower. It is the careless and dishonest nurseryman against whom vigilance must be exercised. The grower has too much at stake to take avoidable risks.

White Ants in the Orchard.

In localities where white ants are prevalent it is advisable to cultivate a crop before planting fruit trees. In any case it is a good plan to do that first; but if it is not possible, the land should be ploughed early, so that the soil is exposed to weather influences for some time before planting is carried out.

The land should be thoroughly cleared, of course, all roots being run to a proper depth, and all pieces of timber removed or burnt. In localities where white ants are troublesome, stakes should not be used to support trees unless such stakes have first been treated with an effective white ant exterminating dressing; nor should use be made of mulches, such as bush scrapings and grass. Thorough cultivation helps to keep white ants in check.

Inter-Pollination of Fruit Trees.

Pollination varies in effectiveness in different localities and under different conditions. Some flowers (usually very small and inconspicuous) are self-fertilised, and some are wind-fertilised; but, generally speaking, all plants which have conspicuous flowers are fertilised by insect agency, and in the great majority of cases Nature prevents self-fertilisation, one of the preventives being that stamens and stigmata do not develop contemporaneously.

The need for cross-pollination has been more emphasised in the case of apples and pears, but it is also apparent in cherries and in some varieties of both European and Japanese plums. The grower should take steps to assist cross-pollination. Deciduous trees of any kind should not be planted in blocks of the same variety, but suitable varieties of the same kind should be planted in alternate double rows. Any two varieties of the same kind will do, so long as their flowering periods coincide or overlap. For instance, if Granny Smith and Jonathan are the apples to be planted, two rows of the former should alternate with two rows of the latter. The wise grower will naturally prefer varieties which, while suitable for cross-pollination purposes, are also valuable commercially.

Sowed the First Grain—Romance of Australian Wheat.

Sir Alfred Robbins, the distinguished journalist, relates remarkable facts about experiments in Australia in a recent issue of "John o'London's Weekly."

"The Romance of Wheat" can be supplemented by an instance in regard to Australia which, I venture to submit, is more essentially romantic—it certainly is more dramatic—than the results of the experiments in Canada narrated in a recent article. On 29th July, 1782, a young Launceston farmer, named James Ruse, only twenty-two years of age, was at Cornwall Assizes sentenced to seven years' transportation beyond seas, and sent to New South Wales in "the First Fleet" which took convicts thereto. In command of the military overlooking the penal settlement was Philip Gidley King, son of a Launceston draper, and afterwards third Governor of New South Wales. It may be that Ruse, having proved himself of such good conduct as to become the first emancipated convict who had a grant of land given him, came under the notice of his fellow-townsman.

According to the second volume of "The History of New South Wales, from the Records," this freedom for Ruse meant prosperity for Australia. "There was one man who had faith in the fertility of the soil, and who successfully tilled an acre of land where the town of Parramatta now stands, and was rewarded by a free grant of 30 acres—the first document of the kind issued in Australia. Ruse, therefore, was the real founder of Australian agriculture, and deserves to be held in honourable remembrance accordingly. Within eighteen months the farm was self-supporting, and its cultivator was rewarded by the grant of a second 30 acres on the Hawkesbury."

It was fortunate for Ruse that he was promptly given rewards he could enjoy in his lifetime, and did not have to wait for the "fine monuments" satirically foretold by a Canadian paper for the like benefactors of the great Dominion.

In the old cemetery of Campbelltown, New South Wales, stands his original monument, scarcely to be described as "fine," which has the following naively spelt inscription:—

"Sacred to the memory of James Ruse, who departed this life 5th September, in the yeare of Houre Lord, 1837, natef of Cornwal, and arived in this coleney by the first fleet, aged 77.

"My mother reared me tenderly,
With me she took much paine;
And when I arrived in this colleney
I sowd the first grain.
And now with my Heavenly Father
I hope for ever to remain."

Pig Instructor's Itinerary for May.

Wednesday and Thursday, 6th and 7th.—Attend Maleny Show and address pig breeders there.

Monday, 11th.—Leave Brisbane 8.5 a.m. Arrive Nambour 11.20 a.m. Address pupils of Nambour Rural School, 11.30 to 12.30. Visit Perwillowen after lunch, addressing State school children at 2 p.m. Give lantern lecture, Rural School, Nambour, 7.30 p.m.

Tuesday, 12th.—Arrive Rosemount, 9 a.m. Visit State school to address children; then visit members of the Pig Club at their homes, to inspect club's pigs, &c. After lunch, arrive Mapleton, 1.30 p.m., and address members of Mapleton and Flaxton schools at 2 o'clock. Lantern lecture in the evening to be arranged for.

Wednesday, 13th.—Visit members of Mapleton and Flaxton pig clubs to inspect pigs, thence depart to Obi Obi, giving lantern lecture at Obi Obi School, 8 p.m.

Thursday, 14th.—Take tram from Mapleton, arriving Nambour 9 a.m.; take train to Yandina, 11.20 a.m.; spend day between Yandina and North Arm schools, visiting farms as arranged. Give lantern lecture at Yandina school, 8 p.m.

Friday, 15th.—Leave Yandina, 9 a.m.; arrive Woombye, 9.40 a.m.; spend day between Woombye and Palmwoods schools. Lantern lecture at night if same can be arranged for by L.P.A.'s.

Wednesday and Thursday, 20th and 21st.—Attend Ipswich Show and address pig breeders there.

Protection of Wild Deer.

In pursuance of the provisions of "*The Animals and Birds Acts*, 1921 *to* 1924," an Order in Council has been issued, declaring deer to be protected throughout Queensland.

Butter Board Ballot.

The Butter Board ballot has resulted as follows:—

Division No. 1.—Wm. Whiting, Atherton, 4; James Lockie Wilson, Gladstone, 7.

Division No. 2.—James McRobert, Maryborough, 4; James Thomas Mulcahy, Nanango, 5.

Division No. 3.—Wm. Dearling, Oakey, 3; James Purcell, Toowoomba, 6.

Division No. 4.—Charles Henry Jamieson, Tent Hill, Gatton, 6; James Theo Tod, Goomburra, 5.

Division No. 5.—Thomas Flood Plunkett, Beau-Parc, Beaudesert (unopposed).

Royal Society of Queensland.

At the last meeting of the Royal Society of Queensland, Messrs. F. Berry Smith and T. G. Jones read two papers detailing the results of their investigations of Queensland plant products. The oleo-resin of *Canarium Muelleri*, a tree growing in the scrubs of North Queensland, was submitted by them to chemical analysis, and it was found to contain some useful and highly aromatic compounds. The essential oils contained pinene as a principal constituent, and it was pointed out that if the oleo-resin were available in large quantities it would be of economic value as a source of turpentine. The resin consisted chiefly of two amorphous solid alcoholic bodies, isomeric with the crystalline amyrins.

It was suggested by Mr. W. D. Francis that the resin was a possible substitute for Canada balsam, as a microscopic mountant, as he had used it as a mountant, and up to the present the preparations compared very favourably with similar ones in which he had used, Canada balsam and gum dammar.

Messrs. Smith and Jones had also investigated the oil of the Queensland pennyroyal, mentha saturcioides, and found that it was similar to the pennyroyal of commerce, its chief constituent being pulegone, together with menthol and minor constituents.

In the discussion on the papers much appreciation of the highly useful work of the chemists was expressed.

Mr. W. H. Bryan communicated a paper by Dr. H. I. Jensen on the granites of the Croydon district and the so-called intrusive bar. Dr. Jensen, who is absent from Brisbane, had subjected samples of the rocks to microscopic examination, and concluded that they were typically granitic in structure and origin.

Mr. H. A. Longman exhibited specimens of a python originally supposed to be confined to North Australia, and a baby crocodile from a fresh-water river in the Northern Territory. He remarked that the natives and most of the white inhabitants of Northern Australia do not regard the fresh-water crocodile as being dangerous.

Specimens of rhyolite from Mount Lookout, Stradbroke Island, were shown by Dr. E. O. Marks, who stated that there were three rocky parts on Stradbroke and Moreton Islands—namely, those at Dunwich, Point Lookout, and Cape Moreton, and it was an interesting fact that the rock at Point Lookout differed fundamentally from those at Dunwich and Cape Moreton, which were regarded as stratified rocks of the Ipswich series. The possible connection of Point Lookout with the high submarine mountain about 50 miles oceanwards from Southport was suggested.

Contract Clearing—Some Hints.

In some cases fruit-growers or prospective fruit-growers will be clearing land for future use. If the work is done by contract there are important points to be included in the agreement. Among the necessary stipulations (after agreement as to the price to be paid per acre) are:—

That work is to be completed within a specified time.

That all stumps be removed to a specified depth.

That all stumps and trees that stand on the boundary of the area to be cleared be treated as though within the area.

That timber, logs, stumps, &c., be not rolled over the boundary line.

That all stump holes be filled in level to the general surface.

That all timber, except that agreed upon as being useful for fencing and other purposes, be burnt.

The contractor to follow the plough, and to remove all roots, &c., which obstruct the plough.

Progress payments up to 75 per cent. of the work done to be paid to the clearing contractor; the balance on completion.

Before fencing it is advisable to fell any trees that lean over the line to be fenced. If a contract is let for fencing, specification should be clearly drawn out stipulating the size of the posts, depth of post holes, number of wires, gauge of wire, distance posts are to be apart, distance apart of strainers, diameter of corner and gate posts, length of posts, kind of timber to be used, and so on.

To Discourage Bees from Swarming.

Not many years ago bee-farmers depended upon the swarming of their bees to provide increase, and much was done to encourage swarming. Artificial methods of obtaining increase, however, have reversed the position entirely. There are various reasons why swarming should be discouraged. It is not convenient, for instance, for the bee-keeper to be always on the lookout for swarms, more especially in out-apiary work. Again, the bees may swarm and thus divide their working force at a period when the best results could be obtained by keeping the whole colony intact. Nor may increase be desired by the apiarist at the period when the bees are inclined to provide it, while there is always the risk of losing the swarm.

To be successful in swarm control it is necessary to combine with selection in breeding a good system of management, working against those conditions which induce a colony to swarm. A colony with insufficient accommodation, for example, will surely endeavour to relieve the congestion in the hive. It is, therefore, necessary to provide ample hive accommodation. Good combs built from full sheets of comb-foundation in the brood chamber for the queen to lay in, and provision for the expansion of the brood nest as required by the colony in their building-up work, are both of help in swarm control. The comfort of the colony must also be considered, by the provision of ample ventilation and the shading of the entrance to the hive during hot weather. Colonies with young queens are less disposed to swarm than colonies with old queens.

Answers to Correspondents.

Pig Feeding and Breeding.

L.G.A., El Arish, asks whether immature and overripe, bruised, and damaged bananas can be safely and profitably fed to pigs; also as to the use of cassava roots. He also inquires regarding the addition of milk to a ration consisting of the above fruit and tubers, all three of which foods he has available for pig-feeding purposes. He asks for information as to the most suitable cross for the production of bacon pigs, and states that portion of his land is swampy and has a heavy crop of bulgaroo, a yam-like tuber growing to profusion in some of the lower-lying coastal lands.

To save repeating published information, copies of departmental publications on the pig have been posted to this correspondent.

On the question of feeding bananas to pigs, the Instructor in Pig Raising, Mr. Shelton, says that they may be used to advantage, but it would certainly be wise to add some maize or maizemeal when boiling the bananas to balance the ration and add to its value. The pigs, of course, require also ample supplies of green food and clean water.

Re the use of cassava for pigs, this will not grow to advantage in the South, but further information as to its feeding value may be obtained from Mr. Pollock, Instructor in Agriculture, at Department of Agriculture and Stock, Townsville, or from the Manager of the State Farm at Kairi, *viâ* Cairns.

Milk is, of course, an ideal food for pigs of all ages. All the root crops are useful, sweet potatoes being the most prolific and valuable in Queensland. Artichokes make a splendid food also.

The Berkshire and Tamworth are two reliable breeds with which one could not well fail. They would be the most suitable types for a start, and if suitable Tamworth-Berkshire sows are obtainable, we would recommend using a pure-bred Berkshire boar, but if only Berkshire sows are available, a Tamworth boar would be the most suitable; then the progeny of these crosses should be mated back to a Berkshire boar when available. It would be preferable to purchase these sows at about nine to 12 months old, but it is doubtful if one could secure stock carrying as much age as this, for there has been a heavy demand for store pigs as well as for breeders this year, so one would probably have to be content with younger sows. No doubt the Secretary of the Pig Pool Board, at Atherton, could assist this correspondent in this regard. If desired, we could make purchases at the Brisbane Show stud pig sales in August, these sales being specially for pure-bred pigs.

It is difficult to quote prices, but from five to ten guineas each would be very reasonable for sows up to twelve months old, and a boar could, no doubt, be secured for similar prices. It certainly pays to breed good pigs. If he breeds good stock, his neighbours for many miles around will soon look to him for the supply of young boars and sows. At any rate, one cannot expect to buy breeding stock at less than "meat" value.

Mr. Pollock, of Townsville, has good information on bulgaroo as pig food. It is certainly a very useful tuber, but, of course, would only have a limited life in a pig run, so it would have to be supplemented with other foods.

An Egg-Eating Fowl.

Poultry (Kilkivan)—

The Poultry Instructor, Mr. P. Rumball, advises that your fowl has developed one of the most difficult habits to cure. In the first place, possibly due to the thinness of the shell, the egg became broken and the habit of egg-eating was formed. Give the bird plenty of shell grit to improve the quality of the egg shell, then pare the beak down, so making it tender; provide secluded nests. Egg-eaters as a rule are better in the oven than in the yard, as their bad habit will rapidly spread among the flock.

Mortality Among Pigs.

A Toowoomba correspondent makes inquiries regarding the cause of death of two pigs recently purchased by him. Mr. Veterinary Surgeon McGown replies:—This correspondent does not state how the pigs had been fed before he purchased them, and it is quite possible that sudden change of diet was the cause of death.

When pigs are brought in from a strange piggery attention must be paid to the feeding, otherwise disorder of the digestive organs may result. See reply to H. P.

Mortality Among Sucking Pigs.

H.P. (Plainby)—Mr. McGown, of the Veterinary Staff, advises:—

From the description given it appears that the pigs are dying from malnutrition caused by the animals not getting the necessary nourishment from the sow. It is therefore advised that sows, when suckling young pigs, should be put on a diet of corn, pumpkins, and sweet potatoes as a mash, and thinned down with skim milk to the consistency of thick porridge. A tablespoonful of cod liver oil added to the mash will give the required vitamines in building up the animal body. Green lucerne should also be allowed, as this fodder is required in making milk.

Horse Ailment.

F.C.D. (Peachester)—Mr. Veterinary Surgeon Rudd advises:—

Draught horse continually biting himself—No reference is made as to how this horse is fed.

Give the following lotion—Barbadoes aloes, 5 drachms; Extract of belladonna, ½ drachm: Powdered ginger, 2 drachms; Molasses, sufficient to make a sticky mass, which should be compressed into a ball.

Two bran mashes at a six-hour interval should be given and the horse fasted for fourteen hours before balling, which is best done about 10 a.m., and the horse thereafter kept under cover until the physic has acted. If the biting continues after the ball has acted, then spray the horse with Cooper's Dip, 1 oz.; water, 1 gallon; which is equal to one part of Cooper's Dip to 160 parts of water. Keep him out of tick-infested paddocks, and, if necessary, put him on stable feed. Scrape off the excess of dipping fluid with an ordinary hoop-iron scraper.

Giant Couch and Rhodes Grass.

W.R.S. (Mount Larcom)—The Director of Agriculture (Mr. H. C. Quodling) advises:—

"Giant Couch" (*Panicum muticum*) is an excellent grass in tropical and sub-tropical regions. Stock find it very palatable during the growing season. The grass is partial to red scrub soil, but does best in localities where the rainfall is generous. In shallow swamps and low-lying situations which are not subject to lengthy inundation it thrives. If "Giant Couch" were a free seeder it might be fair to compare it with Rhodes grass were consideration given to the choice of grass on newly burnt-off scrub-land. It is, however, never likely to compete with Rhodes either in popularity or adaptability to new scrub country, for the simple reason that Rhodes spreads so quickly from seed. "Giant Couch" does not seed ordinarily and must be propagated by hand from cuttings. The Agricultural Chemist (Mr. J. C. Brünnich) adds a note that "Giant Couch," like most panicums, contains a hydrocyanic acid sometimes present in dangerously high quantities, and caution must be observed when feeding it, particularly to stock that are allowed to graze.

A Much Neglected Volume.

M.J.L. (Wallumbilla)—

The Official Year Book of the Commonwealth of Australia is prepared by the Federal Statistician, Mr. C. H. Wickens, F.I.A., F.S.S., edited by Mr. John Stonham, M.A., and published annually by the Commonwealth Bureau of Census and Statistics, Melbourne. The local School of Arts library should contain a copy. It is a most useful reference work, replete with the latest information about Australia and its industries. Its price, if available for general distribution, may be ascertained from the publishers.

Sickness Among Pigs.

G.F.C. (Dallarnil)—Mr. Veterinary Surgeon Rudd advises:—

It is not possible to state the cause of the sickness among the pigs without an examination, but in all probability it is due to the conditions under which the pigs are kept.

Wash the part with a saturated solution of washing soda, applying a certain amount of energy and pressure in order to remove the dead necrotic tissue, and paint with methylated spirit. Keeping the troughs scrupulously clean and the skim milk from fermenting in a dirty tub before it is fed to the pigs is also worthy of consideration.

Wood ashes and charcoal, together with a ration of green lucerne, will certainly assist in the preservation of health, but good clean sleeping accommodation is an important factor which should not be overlooked.

Treatment of Fistula.

G.C.T.W. (Murray's Creek)—Mr. McGown, of the Veterinary Staff, advises:—

This disease when once formed does not yield readily to treatment, an operation is necessary and should only be performed by a qualified veterinary surgeon. When the swelling is first noticed it may be checked by the application of a blister, composed of the following:—

Bin-iodide of Mercury	1 part
Lard	8 parts

This should be rubbed into the affected part for ten minutes. When the blister has been applied it will be necessary to tie the horse up for twenty-four hours in order to keep him from rubbing or biting the blistered part.

Prickly-Pear as Pig Food.

W.W. (Jandowae)—

The Instructor in Pig Raising, Mr. Shelton, advises:—It would be unwise to make a general recommendation advising farmers to look to prickly-pear as a profitable source of food supply for pigs, for, after all, the pear consists very largely of water and fibre, with very little nutritive value except as a standby during periods of drought. You will be well advised, however, to make the cultivation of crops suited to pig-feeding a special part of your farm routine, for it is understood that you could grow sweet potatoes, artichokes, lucerne, cereals (maize, wheat, barley), greenstuffs, such as saccalin, sudan grass, grain sorghums, and a variety of crops. These are all strongly recommended as suitable foods in one form or another for pigs, whereas prickly-pear is looked upon with a good deal of suspicion, and as of very little food value at any time for pig-feeding. We think, also, that by the time you pulp and boil the pear that it will cost more than it is worth. Pollard and maizemeal are suitable foods, and fed in conjunction with lucerne and the other crops mentioned should give you good results.

The whole subject of feeding pigs is fully dealt with in a departmental pamphlet on "Pig Raising in Queensland," by Messrs. Quodling and Graham, and if, after perusing this pamphlet, there is still other information you desire to secure, we will gladly supply same on receipt of your advice. Meantime, of course, if no other green foods are available, you are quite safe in using a limited amount of prickly-pear, particularly for breeding sows, the boar, and growing pigs.

Farm and Garden Notes for June.

Field.—Winter has set in and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by the Copper Carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sandpit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all cotton in the Central District should be consigned to the Australian Cotton-growing Association, Rockhampton or Gladstone, whichever is nearest; whilst those in the Southern areas should consign their cotton to the Association at Whinstanes, near Brisbane. All bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Kitchen Garden.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

Flower Garden.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in

position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, freesias, snowflakes, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crops still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States, if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash, or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry, the tree should then be given a good watering, and when the water has soaked in, the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder, and if the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas

during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay, or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bone dust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall they should be watered regularly. In fact, in normal seasons, an adequate supply of water is essential, as the plants soon suffer from dry weather, or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune for to plant out new vineyards.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt Area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt Area which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring and thus get a good start. Be very careful what you plant. Stock to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district, and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island prosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly-drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt and the vineyard ploughed up and well worked to reduce the soil to a good state of tith, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	MAY.		JUNE.		MOONRISE. MAY.	JUNE.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·18	5·20	6·36	5·3	12·45	1·16
2	6·18	5·19	6·36	5·3	1·25	1·50
3	6·19	5·18	6·37	5·3	2 5	2·28
4	6·20	5·17	6·37	5·3	2 42	3·9
5	6 21	5·17	6·38	5·2	3·17	3 53
6	6·22	5·16	6·38	5·2	3·55	4·41
7	6·22	5·16	6·39	5 2	4·34	5·33
8	6·23	5 15	6 39	5·2	5·16	6 32
9	6 23	5·14	6·40	5 2	6 2	7·36
10	6·24	5·14	6·40	5 2	6·53	8·42
11	6·25	5·13	6·41	5·2	7·47	9·48
12	6 25	5·13	6·41	5 2	8·48	10·50
13	6·26	5·12	6·42	5·2	9·52	11·51
14	6 26	5 12	6·42	5·2	10·55	...
						a.m.
15	6·27	5·11	6·42	5·3	11·58	12 50
16	6·27	5·10	6·42	5·3	a.m.	1·45
17	6 28	5·10	6·42	5·3	12 58	2·42
18	6·28	5 9	6·43	5·3	1 56	3 37
19	6 29	5·9	6·43	5·4	2·53	4·30
20	6·29	5 8	6 43	5·4	3·49	5·25
21	6·30	5·8	6·43	5·4	4·45	6·17
22	6 31	5·7	6·43	5·4	5·41	7·8
23	6·31	5·7	6·43	5·4	6·35	7 56
24	6·32	5·6	6·44	5·4	7 30	8·42
25	6·32	5 6	6·44	5·4	8·21	9·23
26	6 33	5·5	6·44	5·5	9·12	10·2
27	6·33	5 5	6·44	5 5	10·0	10 39
28	6·34	5 4	6·44	5·5	10·43	11·15
29	6·34	5 4	6·44	5·5	11·23	11.49
					p.m.	p.m.
30	6 35	5·3	6·44	5·6	12·2	12·26
31	6·35	5·3	...	...	12·40	...

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

1 May	(	First Quarter	1 20 p.m.
8 ,,	○	Full Moon	11 43 p.m.
15 ,,	)	Last Quarter	3 46 p.m.
23 ,,	●	New Moon	1 48 a.m.
31 ,,	(	First Quarter	6 4 a.m.

Perigee, 11th May at 11 48 p.m.
Apogee, 27th ,, at 7 30 a.m.

THE PLANETS.

Mercury will be at its greatest elongation west of the sun at 9 p.m. on the 16th May, and will therefore be visible in the early mornings in the North Eastern sky.

Venus will be apparently too near the sun to be noticeable during this month.

Both Mars and Neptune will be in conjunction with the moon before the end of the month, but in such positions with regard to the sun as to be practically unobservable.

Jupiter will be stationary on the 11th May at 4 a.m., after which it will apparently move westwards amongst the stars of Sagittarius, till 10th September. On the 13th Jupiter will seem to be very near the moon soon after sunset in the N.W.

Saturn will be in opposition to the sun and at its nearest distance from the earth, about 750 millions of miles, on 1st May. On 8th May it will be in conjunction with the moon about 11 a.m. when it will be two and a half degrees to the southward. When the moon rises it will have advanced about three degrees further east, and the apparent distance between the planet and the moon will be slightly increased.

7 June	○	Full Moon	7 48 a.m.
13 ,,	)	Last Quarter	10 44 p.m.
21 ,,	●	New Moon	4 17 p.m.
29 ,,	(	First Quarter	7 43 p.m.

Perigee, 8th June at 1 54 p.m.
Apogee, 23rd ,, at 6 24 p.m.

THE PLANETS.

The Australian Winter Solstice will occur on the 22nd June when the sun will reach its greatest Northern latitude, and the shortest day will occur. It will be interesting to notice at what points on the horizon it will rise and set.

Mercury will be in superior conjunction with the sun on the 20th June, that is, on the farthest side of its orbit beyond the sun, and therefore invisible for a week or two.

Venus will be still apparently too near the sun to be noticeable.

Mars is getting still lower towards the Western horizon soon after sunset, and becoming less and less noticeable. It will be in conjunction with the moon on the 24th. Jupiter will be in conjunction with the moon on the 9th at 5 p.m., and the two will therefore present an interesting spectacle soon after the moon rises, especially after 8 p.m.

Saturn will be in conjunction with the moon on the 4th at 5.49 p.m., when both will be well above the Eastern horizon.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The June Journal covers a very wide range of interest. Banana-growers will find the record of Mr. Girault's investigation of "Thrips" of particular value. Mr. Edmund Jarvis has an excellent series of science notes which will be very useful to sugar men. Mr. Grenning, of the Forestry Service, has a timely contribution on the question of the establishment of softwood plantations, in the course of which he reviews the present position of our softwood resources. Mr. Tardent, who is so well known to the farmers of the State, and who now controls the horticultural section of the Queensland Magazine, has a seasonal note on frost prevention. Some of the causes of low-grade cotton are discussed by Mr. Ballard, who calls particular attention to two insects whose destructive activities often escape the notice of cotton-growers. Pig-selling systems in Queensland are described and commented upon by Mr. Shelton. Both special and regular features of this month's issue are sure to meet with the appreciation of readers.

Agriculture on the Screen.

The Department of Agriculture and Stock is engaged on the making of a complete series of films depicting all phases of rural life and industry in Queensland. Already films of our cattle, wool, sugar, and banana industries have been made, and copies have been released for metropolitan circuits. Copies have also been sent overseas as a migration stimulant. The films show glimpses of country social life as well as Queensland at work. Each production is realistic and was "made on the farm," and its excellent photography reflects great credit on the departmental cinematographer, Mr. Burne. This is a State that can stand the truth, and each picture is an excellent presentation of things as they are in rural Queensland.

The State Radio Station.

The Premier (Hon. W. N. Gillies), when Minister for Agriculture, saw early the possibilities of wireless telegraphy and its value to agriculture and country commerce, and his efforts have led to the establishment of a large scale State radio service. The work of construction of a Government broadcasting station on the roof of the State Insurance Building is already nearing completion, and before long it will take its place as an important influence in the social life of Queensland. The aim of the Government is to bring this modern medium of education and amusement within the reach of every citizen. The operations of station 4 Q.G., the radio designation of the new broadcasting centre, will be controlled in such a way as to render complete community service. Daily general news services, morning market reports, morning Stock Exchange information, and morning cable news will be broadcast. The farmer will, while seated at his own lunch table, be able to hear by wireless the actual market reports relating to that very morning's sales in Roma Street. Special arrangements are being made between the Queensland Radio Service and the Council of Agriculture for the supply of this information. The farmers' own market representatives on the Council will collect the market data and will actually speak by wireless to the farmers themselves each day. Every afternoon, between three and four o'clock, a musical programme will be provided for the social hour of country women. From half-past six to seven o'clock in the evening bedtime stories will be broadcasted for the benefit of country children. At the conclusion of this session, the farmers' own representative will review the day's markets for the benefit of those who did not listen-in at lunch time, and will also give later market reports. Late news and cable services, as well as any late sporting results, will also be provided. The night session will occupy from eight to ten o'clock, in the course of which high-class musical entertainments will be transmitted. In this feature all tastes will be considered. Short lectures on interesting subjects by prominent authorities will also be a feature of transmissions from the station. Parliament House is being linked to the centre, and on occasions parliamentary debates will be broadcasted. It is intended to place a line in the Premier's own office, so when it is necessary to make an announcement on matters of public interest the head of the Government will be able to speak direct to the people of Queensland. Special attention has been given to the provision of weather forecasts, and excellent arrangements which should result in the farmer being supplied with accurate, speedy, and reliable weather information two or three times a day have been completed.

Revival in the Cattle Industry.

In cattle circles optimism is becoming evident and there is a distinct feeling that the industry has plumbed bottom. Present values already indicate a definite upward trend. Reports from America show that liquidation in the industry has run its full course there. In an article in the current American Bankers' Association Journal the writer (Robert A. Cooper, chief of the Federal Farm Loan Board) asserts that the shrinkage of a million head of cattle a year in America's herds as disclosed by Government figures understates the actual drop in the supply. At the request of President Coolidge he recently made an extended tour through the Western live stock States. He reports that the industry is now financially on the up-grade, declaring that war-time over-production has been followed by decreased herds in every State west of the Missisippi River. In the United States, as in Australia, constructive upward tendencies are much in evidence.

Ratooned Cotton.

The quality of ratooned Queensland cotton is discussed by Frederick Summers, B.A., M.Sc., of the British Cotton Industry Research Association in chapter XXV. of volume III. (1924) of Shirley Institute Memoirs. The advantages and disadvantages of ratooning are discussed from the horticulturist's point of view. A comparison is described between a sample of Queensland cotton grown from seed and a sample grown under the same conditions from plants which have been ratooned at the end of the previous season. In the case investigated, the conclusion drawn is that the quality of the ratooned cotton is inferior to that of the normal product. It is not suggested, however, that ratooning should be condemned without more evidence from other parts of the world.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

Mr. W. Cottrell-Dormer, who is investigating pests and diseases in connection with sugar-cane crops, reports for the period March-April to the Director, Mr. H. T. Easterby, under date 24th April, 1925:—

As the greater part of the month which has elapsed has been excessively wet, a great deal of the time was spent in the laboratory studying fungus diseases of cane in the South Johnstone, and some very interesting information was obtained. By far the most serious disease factor in these wet districts is the group of little known fungi which cause root disease.

Leaf Scald.

This disease is present in most parts of the Johnstone River Districts, but, on the whole, is not yet doing really serious damage, with the exception of one or two isolated cases where N.G. 24B is being very seriously injured along the Main Line and on No. 2 branch in the South Johnstone. It will be remembered that in my last report on this district it was observed that the disease was at its worst in the Japoon area, but as I was unable to visit this area on this occasion I am unable at present to make any comparisons with the extent of damage in the areas visited, though it can safely be said that in no case was the infection found to be quite as great as that observed last year in the Japoon district. However, the symptoms of this disease are very elusive, and we may find that fields which appear perfectly healthy in April will prove to be badly infected in September. Next in order of apparent infection to the areas mentioned above would come No. 6 branch and Daradgee and the Moresby, all of which are lightly infected throughout according to the existing evidence, while Mundoo would rank about last. The Goondi growers are fortunate in being provided with the services of Mr. J. Trivett, and will be well advised to take careful heed of his instructions.

Leaf Stripe.

Leaf stripe was met with on three farms at Boogan, Moresby, and Currajah, which is better known as the Five-mile. In each case the affected variety was Badila and the disease was in the yellow stripe stage. There is but small likelihood of this disease ever becoming serious in Badila, and in the cases mentioned above only a few stools were found showing signs of the disease, yet it is the more dangerous for this very reason, since, because of the inconsequence of the damage done, the average grower will take but little notice of it, thereby allowing the disease to spread; at the present time as much as 20 per cent. of the cane grown in some localities is Pompey, which, as is well known, is very susceptible to this disease. Thus if the disease is not checked in its present small proportions there is every chance that it will find its way into the Pompey and cause very serious losses.

Root and Leaf Sheath Diseases.

By reason of the conditions of excessive humidity which obtain in the Johnstone River districts during a great part of the year this is a true wonderland of the lower botanic flora. Wherever one goes in this great cane district beautiful and grotesque fungi are constantly met with. Some are parasitic on the cane plant itself, but the greater number are merely saprophitic and depend for their sustenance on the refuse of the cane field, such as trash and dead or dying stalks.

The Stinkhorns.—Prominent among these wonderful plants are the Stinkhorn fungi, so-called from the unpleasant effluvium which invariably accompanies them. These are of interest to the canegrower, since in Hawaii and other cane-growing countries closely related species have been attributed with powers of attacking the roots of sugar-cane and thereby causing serious root disease, though the general tendency with pathologists to-day is to discredit these powers.

Two species were met with in the districts visited—a white one and an orange-yellow one. Both are similar in shape, and consist mainly of a central stem tapering from a base about 1 inch in thickness and reaching a height of about 6 inches, where a large thimble-shaped cap is attached, while from this cap a billowing mantle

is suspended which reaches down to about an inch from the ground, the mantle being composed of a frail fungus network whose meshes somewhat resemble those of a mosquito net, though they are rather larger. On digging about in the soil below these plants a quantity of thin pink strands of fungus roots are found which interweave themselves amongst the roots of the cane, though no intimate connection can be seen between the two.

Sclerotial Disease.

This disease, which was described in my last report, is a leaf sheath disease, and is the cause of clinging trash and of spindly sticks. It is due to the activity of a fungus which thrives in very moist conditions and whose occurrence in cane fields is very much extended by the indiscriminate use of pink sticks, where the variety Badila is concerned, during the plant-season. This disease is very prevalent indeed in the Johnstone River districts, but especially in the Mourilyan areas, about Moresby, and in parts of the South Johnstone.

Another leaf sheath disease, which was observed in the South Johnstone district on one farm near the Cross Roads, is that caused by a species of Himantia, perhaps *H. Stellifera*, which sometimes causes appreciable damage to cane in other countries. The infection in this case, however, was very small, and there is little likelihood of the fungus ever becoming a serious factor in these parts.

A rather serious leaf and leaf sheath disease, which was observed in the Babinda district, was also found occurring in this district in small patches here and there. This consists of large dead spots 1 to 2 square inches in surface surrounded by a dull red and irregular border, which are found on the leaves and leaf sheaths of affected stools. These spots often coalesce and form very large dead strips on the leaves or leaf sheaths. In damp weather at least are found a light fluffy growth of fungus and small oval conglomerations of fungus mycelium on the under side of the leaf. Affected cane when young is usually backward, so that the disease is probably a virulent one and is well worth watching lest control measures may prove necessary.

Grubs.

The larvæ of the Greyback Beetle would seem to be striving to excel themselves this year in their work of destruction. Acres of fallen cane are to be seen on the red soil ridges and the loss to some growers promises to be quite ruinous. The two worst affected localities seen by me were the Crossroads and parts of Daradgee, though I was led to believe that some of the country about Nerada and Japoon was even worse. Branches No. 1, No. 2, No. 6, and the Main Line in the South Johnstone have their full quota of injury, and about 70 per cent. of one farm on the No. 1 Branch is entirely wiped out. Yet many of the grubs at present under the cane stools are only in the commencement of their third stage, so that the visible damage may be expected to extend a great deal further during the course of the next month. The soil in all of these infected areas is loose and friable and aptly suited to fumigation, while nature invariably provides the district with at least a fortnight of fine weather late in December or early in January, so let the Pest Destruction Committees be up and doing, in preparation for the coming season, by planting out suitable trial plots to be laid out by them under the direction of the Entomologist, especially since everything points to ultimate success in this line of control provided the freightage on the necessary chemicals is not too high. The advantages of fumigation with paradichlor. do not stop at saving the treated crop, but also enable the grower to ratoon his cane. The fumes act as a stimulant to the cane in an indirect manner, so that manurial effects are also obtained, and again a recent experiment done by the writer would indicate that the action of certain parasitic fungi which cause obscure root diseases in these parts is very much retarded or even stopped by the fumes of paradichlor, thus giving the cane a good start in its career of productivity.

A very noticeable feature in this year's grub infestation is the marked definition of the damaged fields. In almost every case it is found that the grubs have limited their attack to cane which was fairly big at the time of the beetle flight, such as April plant and late-cut ratoons, while adjoining fields which had recently been cut or which contained young spring plant were left untouched. A combination of this knowledge and of fumigation technique provides a rational control for grubs.

Gumming Disease in the Mulgrave District.

During my stay in the Innisfail district a report reached me that doubt was being evinced by one or two interested farmers in the infected area. As gumming is such a very serious disease, I decided to visit the district. It was found on this visit that during the six or seven weeks which had elapsed since the previous visit

instead of the leaf symptoms of the disease being confined to a small area of about a quarter of an acre, and to two varieties, twelve varieties now plainly showed the symptoms and the area involved was about 10 acres. This would indicate that the weather had become more favourable to the appearance of leaf markings and that the next few weeks will be the time par excellence for growers to carefully go through their fields and report any suspicious symptoms to their secretary (Mr. Curlewis), so that this Bureau may be kept in touch of any further developments during the writer's absence.

To prove beyond doubt that the disease actually was gumming, smears were made from infected leaves and the bacillus causative of the disease recognised. It is to be hoped that this short note will prove sufficient to quell any doubt on the matter.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Cane-grubs at their Worst.

During this month grubs of our grey-back cane-beetle are fully grown, and on badly infested areas (as shown on the accompanying photograph) have either caused the sticks to fall over or fairly eaten them out of the ground.

It is now too late to save the cane by practising remedial measures, since most of the damage is already done, and by the end of this month these grubs will commence tunnelling downwards to depths varying from 9 to 18 inches or more in order to construct cells in which to transform into the pupal state. (See sketch of pupa).

If desired, these pupæ can be destroyed by fumigation at any time during July to October; most growers preferring, however, to leave the beetles to ultimately emerge from such infested land in November or December, hoping that they will then be considerate enough to wing their way to distant fields. It is well to remember, however, that in the event of numerous feeding-trees being situated within half a mile or so to the north-west of such pupæ-infested land the beetles arising from it are likely to migrate to these trees, and after feeding for a couple of weeks to return and lay their eggs in the vicinity of the land that gave them birth.

How to Steal a March on the Weevil Borer.

Growers are advised to place bait-traps on headlands of low-lying blocks of Badila, &c., where weevil-borers have been sufficiently numerous to materially injure crops in previous seasons. By this means it is possible to discover infestation before damage has been effected, thereby enabling farmers to take prompt measures for coping with this pest. Such traps consist merely of pieces of split sugar-cane about 18 inches long, placed in little heaps of from ten to twenty pieces and covered over lightly with trash to exclude sunlight and prevent the sticks from drying too quickly. Visit and examine these bait-traps every second day, and if weevils be found in them among the split pieces advise the Entomologist at Meringa without delay. Tachinid parasites of this beetle borer will be released by the Sugar Bureau free of cost on such infected areas, on condition that the grower will agree to leave about a quarter of an acre of the cane uncut for the parasites to breed in. This should be allowed to stand for about three months, and must not be burnt.

Protect Your Insect Friends.

Do not destroy soil-frequenting larvæ, &c., of beneficial insects which are parasitic or predaceous on grubs injuring your cane, and are often brought to the surface when ploughing.

Some of the commonest of these are figured and described in my hints for March, 1925 (see "Queensland Agricultural Journal," vol. xxiii., pp. 273, 274; and "Australian Sugar Journal," vol. xvi., p. 831).

Combating White Ants.

Growers on the Burdekin should be careful when planting to see that cane used for this purpose does not contain termites.

Field experiments were carried out in this district last month with certain insecticides and fumigants for treating cane sets on termite-infested land, both

before and just after planting same; the chemicals used in such work having previously given promising results in our laboratory at Meringa. Common-sense methods of fighting this pest must not be neglected. Try to locate the source of invasion of canefields, which can sometimes be traced to termite-infested roots,

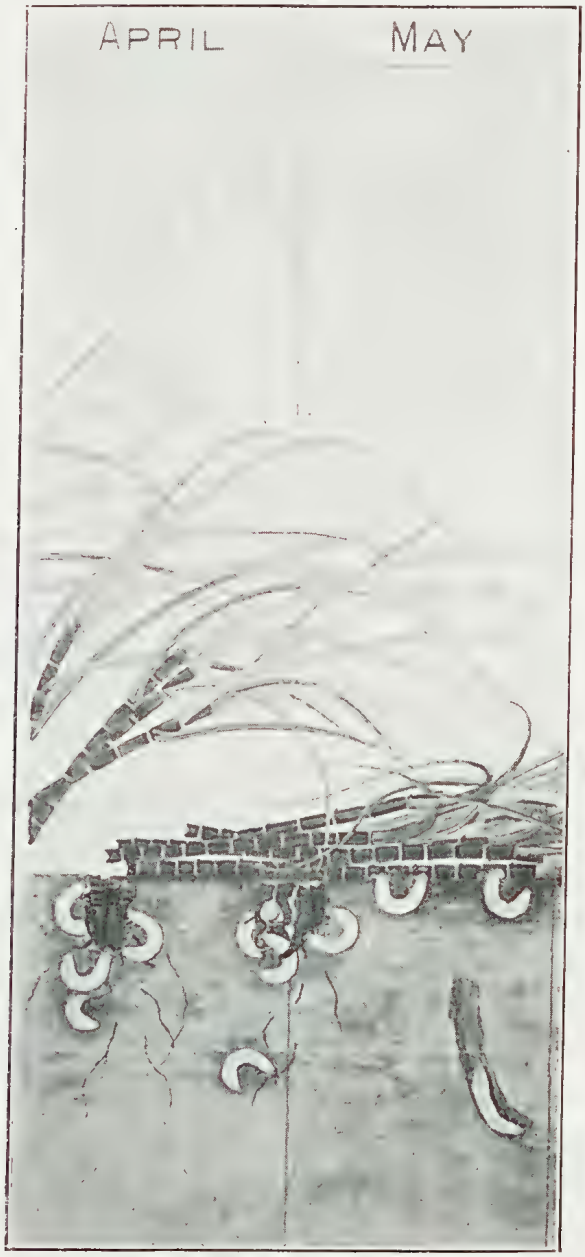


PLATE 82.—GRUBS OF *Lepidoderma albohirtum*.
(Grey-back Cane-beetle).

tree stumps, &c., either situated in the field or on land adjoining it. Burn all affected logs, posts, or timber on or close to headlands. Read Report for February to March dealing with control measures in this connection ("Queensland Agricultural Journal," vol. xxiii., 248, 249; and "Australian Sugar Journal," vol. xvi., pp. 831, 832).

PLATE 83.—PUPA OF GREY-BACK CANE-BEETLE.
(Natural size).

Fighting Grasshoppers.

Our two most injurious species of locusts, viz., *Locusta danica* Lin. and *L. australis* Brunn., may at any time invade plantations; and in the event of their proving troublesome this month or being noticed in great numbers in the vicinity of cane-fields, growers should communicate with the Entomologist at Meringa, in order that such infestation may be duly recorded and position of eggeries noted with a view to subsequent destruction of the early spring brood of young hoppers while they are in the wingless larval condition.

When invasion has taken place a poison-bait may be used, consisting of fresh green grass finely chopped and soaked in a solution of arsenite of soda and 4 to 11 lb. of treacle in 12 gallons of water. This bait should be scattered thinly in front of the swarm while the locusts are moving and feeding, or among the cane upon which they are settled when roosting. I may state that it has given great success against migratory locusts in the Sudan, being readily devoured when the treacle is in the proportion of 4 to 12 gallons of water, but proving still more attractive when the proportion of treacle is increased.

Examine Cane-Sets before Planting.

During planting operations reject all seed showing tunnels of the Weevil Borer, or that may have come from a locality known to be borer-infested. Such seed often harbours eggs or young larvæ, and after planting same the latter may devour enough of the set to cause it to be worthless for support of the growing shoots, with the result that they may die later on, causing unsightly misses.

Moreover, it is by means of such diseased seed that this borer often obtains a footing in clean localities, and, once becoming established, it is not easily got rid of.

In the Burdekin district care must be taken to select seed from plantations known to be free from the presence of the large white-ant or termite, *Mastotermes darwiniensis* Frogg.

Combating Weevil Borers.

Tachinid parasites of this beetle borer will be released by the Sugar Bureau free of cost on infested areas, provided growers will agree to leave about one-quarter or half an acre of such borer cane uncut for the flies to breed in. This should be allowed to stand for about three months after liberation of the parasites, and must not be burnt. For construction of bait-traps see last month's Hints (''Australian Sugar Journal'' and ''Queensland Agricultural Journal,'' May issue, 1925).

Insect Friends of the Canegrower.

Various larvæ, &c., of predaceous and parasitic enemies of cane-grubs are brought to the surface at times when ploughing out cane. Some of the commonest of these are figured and briefly described in the Hints for March, 1925 (''Queensland Agricultural Journal,'' vol. xxiii., pp. 273, 274; and ''Australian Sugar Journal,'' vol. xvi., p. 831).

Movements of Cane-Grubs.

The feeding season being now over, grubs of *albohirtum*, as seen by the accompanying diagrammatic illustration, have gone down into the soil and formed chambers in which to pupate. These are generally found directly under a damaged

stool, at depths which are largely determined by the mechanical condition of the soil and percentage of moisture present at the time. The pupa of this cane-beetle occupies a position of complete isolation, being placed in a specially prepared chamber with its smooth walls lined in a manner calculated to effectually exclude small insect enemies, and prevent it from drying up prematurely or being harmed by

PLATE 84.—ACTION OF CANE GRUBS BELOW THE SOIL

soaking rains. Such isolation of the pupa proves advantageous also to the beetles themselves, which often have to remain several weeks, occasionally months, in these subterranean chambers while waiting for rain to soften the ground sufficiently to allow them to tunnel to the surface and enter upon their aerial existence.

SCIENCE NOTES.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

ON THE VESTITURE OF CANE-BEETLES.

Among other specific distinctions characterising certain of our scarabæidæ affecting sugar-cane, variations in the form and arrangement of the scales present on the elytra in *Lepidiota* and *Lepidoderma* deserve special attention.

This curious vestiture observable in insects, and which is believed to be a modified form of the hairs, occurs mostly on species of the Order Lepidoptera (butterflies and moths), the mealy dust-like substance which comes off on one's fingers when handling such insects being in reality composed of microscopically minute scales of more or less definite shape, countless numbers of which cover both the upper and under surfaces of their membraneous wings.

In addition to occurring throughout this Order, many species of Coleoptera (beetles), Colembola, Thysanura, Trichoptera, &c., are provided with scales.

Before considering the colour and structure of such vestiture, however, it will be of interest to glance for a moment at the origin, development, and uses of scales.

Their growth from certain large cells situated just below the epidermis appears to have been first observed nearly forty years ago, and more recently (1896) Mayer noticed that about three weeks before a butterfly emerges from the pupa these hypodermal cells may be seen protruding slightly above the level of the epidermis. (Fig. 1).

At a later stage they become larger and project from the tops of a series of ridges thrown up at regular intervals across the wing, which ultimately develop in the imago condition into parallel rows of scales, overlapping each other and also covering the membrane lying between them.

According to Kellogg, their primary use is to protect the body, while other scientists think they serve to stiffen the wings, or to prevent a too speedy evaporation of moisture from the body.

The support advanced in favour of the latter view is that, among Colembola, &c., they are found only on those species inhabiting comparatively dry situations, and that scaleless forms, if exposed to similar conditions of temperature, will soon die.

Such inference should, I think, be received with caution, as one could hardly expect these scaleless Colembola, when transferred from their natural surroundings and climate, to endure conditions of temperature that they had never been used to.

Moreover, it scarcely follows that ability in the former to stand excessive dryness should necessarily be attributed to the possession of scales. Take, for example, species of Curculionidæ (weevils) occurring in the Cairns district of North Queensland, many of which, although little in evidence during the day, and flying at night time (*Leptops, Cryptorhynchus*) are densely covered with scales, while others of similar habits and structure have no vestiture whatever. Again, many weevils resting on leaves all day in the hot sunshine are found to be either densely clothed with scales (*Stenocorynus*), provided with them sparingly or in patches (*Belus*), or entirely without scales (*Ectocemus*).

Amongst sun-loving beetles belonging to the Buprestidæ practically all of the species are destitute of scales, which when present are usually placed in isolated tufts or bands (*Cisseis Protætia*).

Such occurrence of scales on flower-frequenting species in which the elytra are of uniform thickness or consistency affords conclusive evidence of the vestiture being intended to serve some purpose other than that of merely checking evaporation of moisture.

Although perhaps helping to protect the bodies of certain microlepidoptera from mechanical injuries and stiffen their delicate wings, I am inclined to believe that scales are intended primarily to protect a species by bestowing upon it such colours as will best match or harmonise with those of the flowers, leaves, bark, &c., on which it habitually rests or resides.

Amongst lepidoptera, such so-called protective coloration is certainly displayed in a most marvellous manner, having attained, perhaps, its highest expression in the well-known Indian "Leaf Butterfly" (*Kallima inachis*), the under surfaces of whose wings exhibit an exact representation of a brown decaying leaf, showing midrib, branching veins, and, in some specimens, blotches in imitation of stains caused by wet weather or fungus growth.

When disposed on the elytra of beetles in tufts or patches—as already noticed in the case of Buprestidæ—such variously coloured scales often tend to disguise the presence of an insect by breaking up its general appearance and body surface, this mode of protection being seen in species of Cerambycidæ belonging to such genera

as *Rhytiphora, Clytra, Glenes, Batocera,* &c. Similarly, the scales when present in Curculionidæ sometimes afford protective coloration, evidence of which is not wanting in such genera as *Cryptorhynchus, Euteles,* &c.

Do not let us forget that the presence of scales on lepidopterous insects makes possible that riotous feast of colour which to most of us recalls pleasant memories of childhood's chase after some bright-winged butterfly; in days when the glamour of early youth cast a golden lustre over the simple joys of life.

Although often unconscious of the spiritual significance of colour, as displayed in the insect and floral worlds, its all-pervading influence is, nevertheless, seeking in a thousand ways to reveal to us the beauty of truth.

Structure of the Scales in Cane-Beetles.

We will now consider very briefly the structure of the various scales found on our cane-beetles, comparing their form with that of those occurring on certain primitive species of class Insecta.

Scales, as already mentioned, are thought to be merely modified hairs, and if we examine the wings of Mecopterous insects, which in structure and metamorphosis are very closely allied to lepidoptera, we shall find numerous examples of remarkable hair-like scales.

An interesting variation in the form of these occurs in one of our common Queensland Hemerobidæ, in which they pass from a decided linear to a broader shape (Fig. 2).

The gradual transition from such more or less primitive vestiture to that displayed by butterflies and other lepidopterous insects is effected insensibly by a beautiful diversification in the size, form, and structure of scales, which vary, for instance, from those with from two to four acutely-lanceolate projections (*Acræa*) (Fig. 3, leaf-shaped (*Psychidæ*) Fig. 4), to elongate to broadly oblong (*Morpho* and *Papilio*) (Figs. 5 and 6).

Again, in moths belonging to the family *Glyphipterygidæ* remarkable scales often occur on the patagia, some of which (Fig. 7) are more or less hair-like, spatulate, or clavate, measuring as much as 0·38 mm. by 0·03 mm.

In the group Coleoptera one meets with scales of strange formation in some species of *Batocera, Leptops, Cryptorhynchus, Mimadoretus,* &c. (Figs. 8, 9, 10, 19).

Among scarabæidæ, commencing with our common grey-back cockchafer *Lepidoderma albohirtum* Waterh., we find the wing-cases of this insect to be uniformly clothed with rather large boat-shaped scales (Fig. 11), measuring 0·20 by 0·06 mm. These project from the surface of the elytra at an angle of about 20 degrees, appearing at such times of elongate or pear-shaped form; the obtuse basal portion of each scale touching or overlapping others slightly, while the free projecting ends taper gradually to a point. They are very convex above and hollow or concave beneath, the lower ends being attached to the chiten by means of a short stalk-like root.

As a result of microscopical examination, I am inclined to believe that in *albohirtum* they serve to aid the beetle during its escape from the ground. In addition to the free ends of these scales being directed backwards, the edges of each (especially where close to the point) are fringed with exceedingly minute spines, which also face towards the anal segment.

In all probability such vestiture helps this cane-beetle to retain its grip on the ground whilst tunnelling to the surface, the position of these scales serving to prevent unintentional retrogressive movement during its upward journey through compact soil.

To illustrate this point the reader should hold a grey-back beetle firmly and pass a finger lightly over the surface of its elytra. Whilst passing from head to tail one feels only a silky smoothness, but in the opposite direction a decided roughness will be felt.

Our species of *Lepidiota* are characterised mainly by the possession of flattened scales of almost circular outline, which do not, like those of *albohirtum,* project from the surface, but rest in shallow concavities formed in the elytra.

In *Lepidiota frenchi* Blackb. and *L. consobrina* Gir. they are rounded, slightly convex above, and finely granulate (Figs. 12, 13); those on the elytra of the latter species being 0·13 mm. in diameter, while on *frenchi* they measure 0·10 mm. These scales, which are scattered thinly over the wing-cases of both the above species, are barely visible to the naked eye as minute white specks that viewed collectively produce the effect of a pale whitish bloom overspreading the reddish-brown ground colour.

In *Lepidiota caudata* Blackb. they are very much smaller, 0·06 mm., and also more sparingly distributed, imparting to freshly emerged specimens a faint opalescent sheen (Fig. 14).

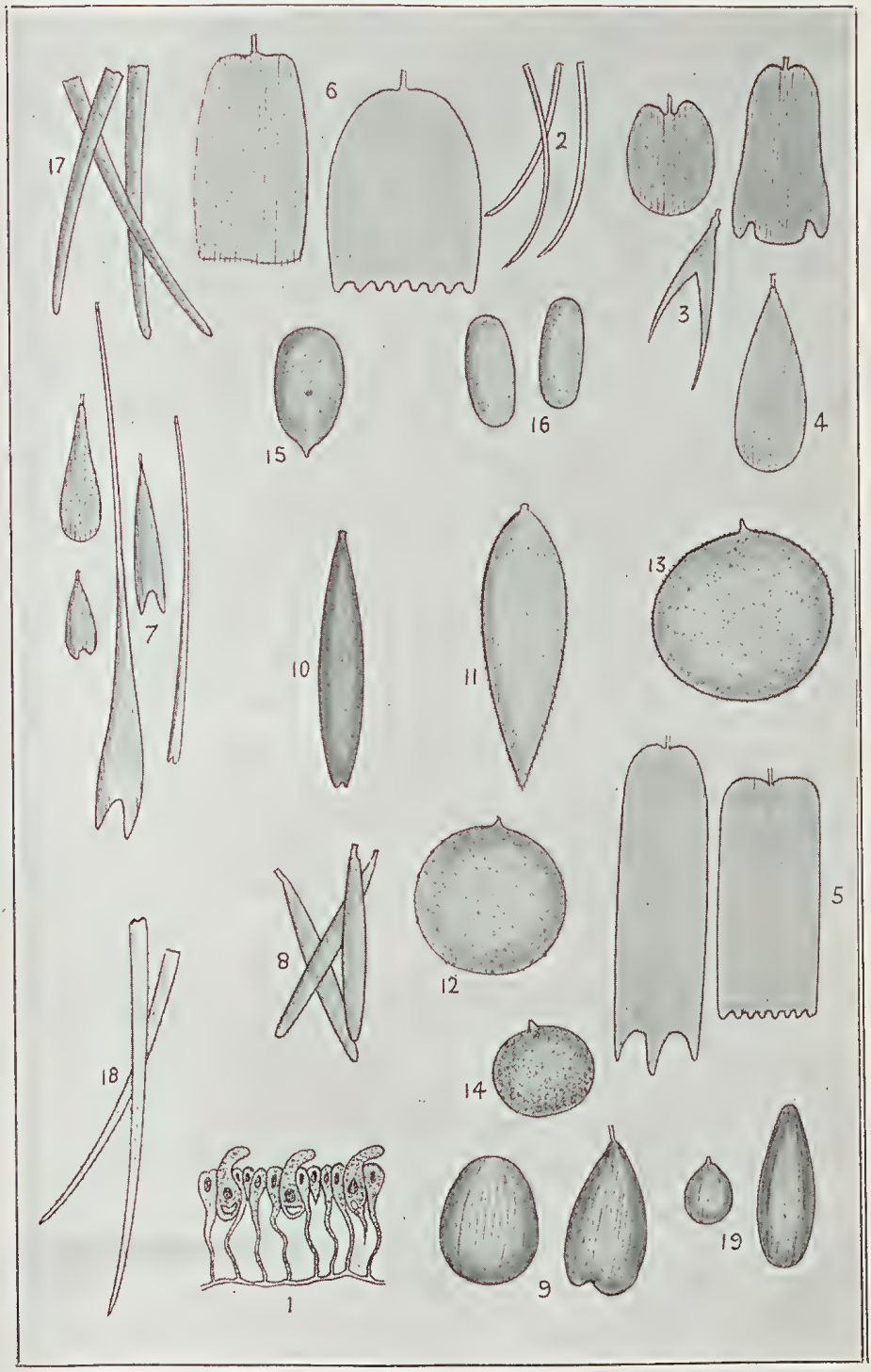


PLATE 85.

Scales occurring on the elytra of Cane Beetles and other Coleoptera; in comparison with scales found on the wings of Lepidopterous Insects.

Figs. 2 to 19 magnified 200; original. Fig. 1, after Mayer.

(*For description of Plate, see page* 466.)

The scales of *Lepidiota rothei* Blackb. (Fig. 15) differ from those of the preceding species in being egg-shaped instead of circular, 0·08 by 0·05; in *L. No. 215*, an insect closely related to *rothei*, they are elongate-oval, 0·08 by 0·03 (Fig. 16).

In this connection it is interesting to note that in the allied genus *Rhopoea* some of the species possess long linear scales which taper from the swollen basal portion to a point, and are very quill-like in appearance; while in *Lachnosterna* again they are longer and practically resemble hairs (Figs. 17, 18).

So closely does the imago of *frenchi* compare with that of *consobrina* in general structure, that for many years systematists failed to recognise them as being specifically distinct (see Bulletin No. 3 of this Office, 1917).

Similarly, *L. rothei* and *L. No. 215* (lately identified at the British Museum as *Lepidiota grata* Blackb.) were classed as being one and the same species until attention was drawn by the present writer to marked dissimilarity between the scales of these cane-beetles (Bulletin No. 3, p. 39).

As a matter of convenience during identification, I have considered the vestiture of the elytra only; but it should be mentioned that scales on the ventral surface, sides, legs, &c., on a few of our scarabæidæ affecting cane often differ slightly in form and arrangement from those on the wing-cases of individual specimens, thereby affording additional specific distinctions.

All scales figured on the plate are of the same magnification, in order that relative differences in size may be appreciated at a glance.

Although so diminutive, each is composed of two separate layers or lamallæ, parallel to one another and kept apart by chitinous filaments, the intervening space being at first filled with protoplasm, which is afterwards withdrawn. In lepidoptera the surface of the upper plate or lamella is usually thrown into a series of parallel ridges, which are often connected transversely by numerous striæ (Fig. 6).

On the wings of species adorned with metallic colours such striations usually exceed 1,000 to the millimetre (1,300 in *Morpho*), but in other lepidopterous insects may be about 100 to the millimetre or even less. In certain blue metallic scales occurring on the wings of *Papilio ulysses* the concavities between striations are closely packed transversely with innumerable minute irregular carinations.

In the scales of our cane-beetles, however, which vary in colour from whitish to very pale yellow, the surface, instead of being striated in this way, is minutely granulate, although in many other coleopterous insects the occurrence of more or less parallel rows of striæ is not uncommon (Figs. 9, 19).

With regard to vertebrate animals, it may be of interest to mention that the cortical portion of the hairs in certain species is formed of imbricated flattened scales, which in some of the bats are arranged around the hair in a series of whorls consisting of long narrow leaflets projecting from the surface of the hairs at an angle of about 30 degrees.

EXPLANATION OF PLATE.

Fig. 1. Longitudinal section through one wall only of the pupal wing of a butterfly, showing development of three of the scales from hypodermal cells.
Fig. 2. Hair-like scales from forewing of Mecopterous insect.
Fig. 3. Scales from the wing of *Acræa andromacha*.
Fig. 4. Scale from a species of Psychidæ (Bag-moth).
Fig. 5. Scales from the forewing of *Morpho ega*.
Fig. 6. Scales from the wings of *Papilio ulysses*.
Fig. 7. Scales of a species of Glyphipterygidæ.
Fig. 8. Linear-shaped scales from an elytron of *Batocera*.
Fig. 9. Convex scales from the elytra of *Cryptorhynchus*.
Fig. 10. Moniliform scales from elytra of *Mimadoretus* sp.
Fig. 11. Scale from a wing-case of *Lepidoderma albohirtum*.
Fig. 12. Scale from an elytron of *Lepidiota frenchi*.
Fig. 13. Scale from an elytron of *Lepidiota consobrinus*.
Fig. 14. Scale from an elytron of *Lepidiota caudata*.
Fig. 15. Scale from an elytron of *Lepidiota rothei*.
Fig. 16. Scale from an elytron of *Lepidiota grata*.
Fig. 17. Hair-like scales from the elytra of *Rhopoea* sp.
Fig. 18. Long hair-like scales from elytra of *Lachnosterna*.
Fig. 19. Convex shell-like scales from elytra of *Leptops*.

Note.—Fig. 1, after Mayer; Figs. 2 to 19 original. All scales magnified 200 diameters.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (28th April, 1925) from the Entomologist at Meringa, near Cairns, Mr. E. Jarvis:—

White Ants Attacking Sugar-cane.

Details of control work against *Mastotermes darwiniensis* Frogg. were recorded in my last report, which contains data regarding results secured at our laboratory by dipping cane-sets before planting in various deterrents. (See "Queensland Agricultural Journal," vol. xxiii., p. 249; and "Australian Sugar Journal," vol. xvi., p. 832).

The most promising of these were tar, and a 10 per cent. kerosene emulsion containing sodium arsenite at the rate of 1 ounce of the poison to each gallon.

Field experiments with these deterrents were carried out on 12th March, when twenty sets were coated with dehydrated tar (ten having eyes well advanced) and planted about 4 inches deep in moist soil. Thirty-three days later (14th April) six of those with forward buds were well above the ground, and two were just shooting, while of the other ten sets only four had developed shoots.

At the same time, 12th March, ten sets after being dipped in the poisoned kerosene emulsion were planted alongside the others; none of these, however, having forward eyes, although one or two were top plants. When examined on 14th April the buds on these sets had not sprouted, being apparently dead.

Wet conditions interfered with the above experiments, as from date of planting to the end of March (an interval of nineteen days) we recorded 18.67 inches of rain; and during April up to the 14th experienced only two days without rain.

Being situated on low-lying ground of a rather heavy clay-loam the planting furrows were repeatedly filled with water, which remained standing over the sets for hours together.

Possibly a coating of tar may help to keep sets from being injuriously affected by continuous wet conditions.

With regard to those dipped in the poisoned kerosene emulsion, failure to grow might have been due to the action of the sodium arsenite on the buds. In laboratory experiments with this solution it was noticed that treated sets in cages did not develop shoots or roots; whereas sets in control cages sprouted and rooted in a normal manner. With dehydrated tar, on the other hand, 100 per cent. development of eyes was obtained in cages containing sets that had been coated with this deterrent.

We are hoping to test the merits of dehydrated tar under field conditions in the Burdekin district this season; and expect to be duly advised by the secretary of the Pest Destruction Board as to when planting will commence on those areas infested by white-ants.

Damage to growing and mature cane sticks from attacks of *Mastotermes darwiniensis* is often of a most serious nature, and unless we combat this pest it may become increasingly troublesome in the future. The accompanying plate affords graphic illustration of these termites at work, and their method of devouring the interior of infested cane sticks.

Liberation of Tachinid Flies.

On 6th March twenty specimens of *Ceromasia sphenophori* were liberated by Mr. G. Bates at Mount Pelion, near Mackay, in standover cane affected by the beetle borer (*Rhabdocnemis obscurus* Boisd.) growing on low-lying ground near the Murray Creek.

In addition to this introduction of living parasites, a breeding-box of cane sticks containing puparia was established in the same situation, from which numbers of these parasitic flies were due to emerge a few days later. Mr. Bates found, upon enquiry, that damage from moth-borer is frequently mistaken for evidence of the presence of weevil borers. Such confusion could easily be avoided if growers would simply cut open an affected stick and locate a specimen of the grub. Should this be plump, creamy-white, somewhat maggot-shaped, and from ¼ to ¾ of an inch long, with pointed tail extremity, light-brown head, and doubled up body, it will be a larva of the weevil borer; but if a pinkish yellow caterpillar from ½ to 1¼ inch long,

and of uniform thickness, will eventually transform into a light-yellowish or silvery-brown moth about 1½ inches across the expanded wings.

On 8th April a liberation of 60 tachinid flies was made at South Johnstone, and a box of three sticks containing puparia of *obscurus* established there.

During the last eighteen months about 9,000 specimens of this useful parasite have been bred here and distributed at various points in the Cairns, Babinda, South Johnstone, Herbert River, Proserpine, and Mackay districts. Most of these liberations have been effected by the setting up on borer-infested areas of specially constructed boxes holding cane sticks containing numerous puparia of this parasite, selected from our breeding-cages with view to ensuring emergence of the flies taking place a few days after such establishment.

PLATE 86.—TERMITES (*Mastotermes darwiniensis* Frogg).
Devouring the central portion of a stick of sugar-cane. (Natural size).

Cane-grub Activity.

At the present time (17th April) grubs of *albohirtum* (grey-back cane-beetle) being in the third instar or fully grown, have entered upon the period of greatest anxiety for the farmer, who may at any time be confronted with unmistakable evidence of the presence of this pest on areas thought to be free from attack.

In several districts late ratoon crops on high lands have already been completely destroyed before attaining a height of more than 2 or 3 feet.

Generous rains have kept the cane growing well, and enabled slightly grub-infested crops to counteract such injuries by making fresh roots. In the event of showery weather continuing, much of this damaged cane may eventually yield a fair return.

It may be well to remind growers that third-stage grubs of the small brown cockchafer (*Lepidiota frenchi* Blackb.) are likely to be troublesome this year to young plant and ratoon cane; so that, when preparing land for early planting the second-stage grubs of this beetle should, if possible, be collected, as otherwise they will transform into the third instar during June to August, and be ready and eager for action in the months of September, October, and November.

Dexiid Parasite of Lepidiota Frenchi.

Two specimens of a large and hitherto unrecorded species of Dexiid fly were reared last January by Mr. G. Bates from third-stage grubs of our common reddish-brown cane-beetle.

This handsome fly measures about 1¼ inch in wing expanse, and is ½ an inch long by nearly ¼ inch in width; its thorax being ornamented with iridescent dark greenish-brown tints, while the abdomen is lighter brown with a dark bluish median stripe and light-green iridescence. In this connection I may mention that eight species of the family Dexiidæ have previously been bred by us from root-eating grubs of scarabaeidæ affecting cane; two of these being parasitic on *Dasygnathus*, two on *Anomala* and *Heronotus*, one on *Anoplognathus*, and two on *Lepidiota*.

These beautiful diptera, which are often mistaken for gigantic blow flies, are usually adorned with brilliant metallic shades of iridescent green, gold, crimson, or blue.

FIELD REPORTS.

Mr. E. H. Osborn, Northern Field Assistant, reports (31-3-25):—

Mourilyan.

During a thirty-three weeks' run this mill accounted for 120,652 tons of cane, of which only 22 per cent. was burnt. Owing to prolonged season and continuous wet the c.c.s. fell rapidly at the end of the season, bringing the season's average down to 12·97 c.c.s., worth 42s. per ton. To cope with the increased tonnage expected this season, many additions are being made to the mill plant. Crops were growing rapidly and showed great promise. Probably 95 per cent. of the cane is Badila, and of the other 5 per cent. a proportion is Q.813, which is steadily increasing its acreage, plant cane of this variety on very medium to poor soil returning up to 29 tons per acre, with a very high density. Particular notice of Q.813 harvested in December, January, and February proved that its sugar content was practically upon a par with Badila cut at the same time. Cane at Cowley was rather upon the backward side, but a very good block of September plant of Mr. R. Gill's was seen, showing good even growth.

A paddock of fourth ratoons N.G.15, manured with 5 cwt. mixed fertiliser in two applications, and owned by Mr. J. McCutcheon, cut at the rate of 28½ tons per acre, and now looks very promising.

Diseases.—Leaf Scald was noticed in the Cowley area to a fairly large extent, standover ratoon, first ratoon, old ratoons, and a little plant cane being affected. Growers are advised to carefully watch any cane that is intended for seed and grub out any stools that show traces of the disease.

South Johnstone.

This mill accounted for 232,257 tons of cane, and also railed another 12,262 tons to Giru. Had not exceptionally wet weather prevailed, about another 15,000 tons of unpermitted cane would have been handled. The huge total of 232,000 tons crushed

at South Johnstone averaged 12·64 c.c.s., and was put through in thirty-three weeks. The whole season was particularly free from labour troubles of any sort, and all hands are congratulated upon the hearty co-operation that was such an outstanding feature of the 1924 season. Tonnage per acre works out at about 24 tons. All the cane seen showed very great growth, and an immense crop should be harvested. A very big proportion of the crop is ratoons, which in nearly all cases seen carried a tremendous growth. One block of second ratoon N.G.15 cut in August, which had not been worked up, looks easily good for a 40 to 45 ton crop. The volcanic soils in this area are wonderfully fertile, and are also very economical to work. As South Johnstone has some 14,000 acres to harvest during the coming season, the crushing problem is a big one.

Pests in the Innisfail area.—Grubs were showing up badly upon several farms in the Daradjee area, while upon others small yellowish patches were noticed. In one patch twenty-seven grubs were taken from under and adjacent to one stool of young ratoons.

In this area grubs were seen in September plant, standover plant, first ratoons, and old ratoons. At South Johnstone a few were noticed upon several farms in the area, but the infestation was not serious.

Diseases.—More scald was noticed throughout the Goondi area than previously, and it certainly looks as if it were spreading. As N.G.15 is the main cane grown in the district, and Leaf Scald has not so far done as much damage as it would do in a more susceptible variety, it is up to the grower to see that none but the very best seed is to be used when planting operations are being carried out.

Babinda.

This mill treated a crop of 206,203 tons of cane, of which only 20 per cent. was burnt. The quantity crushed represents 42,382 tons better than its previous record, whilst the small tonnage of burnt cane reminds one of the very early days of the mill, when the cane was either plant or first ratoon and cutting very heavy.

The huge crushing was very successful from every point of view, and the farmers should be highly pleased with their first year's control of operations. No time was lost through disputes, all hands working well together.

An extensive overhaul is now being carried out. During January, February, and well into March very wet weather, accompanied by periods of intense heat, made conditions ideal for good growth. With the cane in general looking promising, it is rather hard to particularise, but the red soils of Bartle Frere take a lot of beating in this area. One crop of ninth ratoons, practically unworked, looks good enough for an 18-ton crop per acre now, while a crop of fourth ratoons cut early was lying down in places.

Some fine cane was noticed upon the Bartle Frere flats and also upon the Josephine Creek area of the Munro Estates. This has been well worked and manured and promises a very heavy crop. Throughout Bucklands Branch and across the Russell good crops were also seen. At the northern end the cane was green and healthy, but was rather backward.

Pest.—Signs of grubs were noticed upon quite a number of farms, on most of which the owners said that they were unaware of an outbreak. Growers would be well advised to read regularly the entomological notes published in the local papers at short intervals by the Government Entomologist at Meringa, and by digging up, say, eight or ten stools of cane (scattered over an acre) a month or six weeks after emergence of beetles, could then fumigate and stop grub damage at an early stage. Otherwise grubs are not noticed until the cane is yellowing off badly. At this time it may also be hard to procure a pump and fumigants in time to get the best results. Where grubs may be expected it is a good idea to always have a pump and a few drums of bisulphide handy.

Varieties.—Apart from Badila, the mainstay in canes here are H.Q.426 (Clark's Seedling), Goru, N.G.24, 24A and 24B, D.1135 (at the northern end), Q.813, H.Q.458, H.Q.409, E.K.28. Of the three last-named E.K.28 is the principal grown, and some small patches of it look well.

Mr. A. Mayers planted out some H.Q.458 and H.Q.409 upon the red soils of Bartle Frere, but they seem to have grown too vigorously there.

Some 20 acres of Q.813 planted early in August by Dr. Knowles has made such rapid growth that a large portion is already lying down. This particular block seems to be too good for this cane; a poorer soil would probably give better c.c.s. returns, although probably not so heavy a tonnage per acre.

(*Sugar Field Reports are continued on page* 525.)

THE BANANA THRIPS RUST.

By A. A. GIRAULT, Assistant Entomologist.

[*Letter of Transmittal.*]

Sir,—I have the honour to transmit the "Report upon an Investigation of Banana Rust," Gympie, by A. A. Girault, Assistant Entomologist, covering inquiries prosecuted in the Gympie District during July 1924-*February* 1925, *a period subject to brief intervals in them only.*

The investigation to which it relates has for the most part covered the instructions under which it was made, and to this extent, and in its following also independent lines of research, is of a very comprehensive nature.

The exact information that it details regarding the life-history of the Banana Thrips insect, as well as the precise methods pursued in elucidating the action of controlling agencies, endow Mr. Girault's brochure with especial scientific interest and practical value, to all those concerned in any way with the subject to which it relates, and cannot be too highly commended as fulfilling the purpose of the inquiry.

Your obedient servant,
HENRY TRYON.
21*st April*, 1925.

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

Department of Agriculture and Stock,
Brisbane, 18th September, 1924.

INSTRUCTIONS.

Further Investigations, Banana "Rust" Disease.

The investigation is to cover the following matters essentially, premising that the purpose of the work is to discover measures to be adopted for exterminating or controlling the pest—limiting its range of occurrence, as far as possible in each case, without prejudicial effect on the local banana-growing industry :—

1. Bionomics of the *Euthrips musæ* (H.T. MSS.) insect. Supplementary to facts already elucidated, but confirmatory so far as expedient.
   - (*a*) Duration of insect's life in different stages—e.g., Egg stage ; larva, 1st stage ; larva, 2nd stage. Prepupa (? 24 hours—has antennal joints distinct). Pupa (? 2-3 days)—has antennal ones coalesced. Adult.
   - (*b*) Further inquiry as to where eggs are laid in the plant in addition to where known.
   - (*c*) The discovery of the pupa—especially if occurring in soil.
   - (*d*) The adult or winged insect—
     - (1) General habits ;
     - (2) Action as regards light (phototropism), direct observation, relative prevalence in or on shaded or exposed banana plants ;
     - (3) Action as regards gravity—geotropism positive or negative ;
     - (4) Temperature and humidity, influence on occurrence ;
     - (5) Virulence and health of plants as affecting occurrence ;

(6) Movements—flight and migration—

(i.) Direct evidence of flight. Spontaneous spreading as shown by the distribution of occurrence, etc. Influence of wind on.

(ii.) Diurnal and nocturnal movements, especially on occurrence of latter.

(*e*) Alternate food plants, if any. Search of other plants, native or naturalised (securing in each case examples of any thrips occurring for identification).

(*f*) *Second Banana Thrips.* Evidence is forthcoming that a second species of thrips occurs at Gympie on the Banana. This is distinguished by the presence of closely placed rows of granules on the abdominal segments. The circumstances of occurrence of and degree of prevalence of this to be observed. Also its relation, if any, to Rust occurrence.

(*g*) Natural enemies of Banana Thrips.

B.

TREATMENT OF AFFECTED PLANTS.

NOTE.—In considering treatment, the matter of deterring attack or destroying the insect should be considered both from the point of view of practicability and avoidance of injury to the plant or disfigurement of the fruit, such as to prejudice its value as a marketable commodity.

1. *Insecticides.*—The following materials to enter, one or other, into the experimental inquiry :—

(*a*) Soap. Fish oil or whale oil, kerosene soap.

(*b*) Nicotine, as Blackleaf 40—as tobacco dust with water and with soap solution 1 per cent. strength with former.

(*c*) Pyrethrum, as extract, and as dust with fine ashes or other exhibitent.

(*d*) Derrine, fluid and powder preparations.

(*e*) Formalin, as formaldehyde in solution and vapour.

(*f*) Kerosene soap (*vid. supra*) mixture, kerosene emulsion.

(*g*) Bordeaux mixture.

(*h*) Gases, hydrocyanic acid. (Potassium—or sodium—cyanide and calcium cyanide). Others.

The application of those several bodies to have regard to the project of destroying adults, larvæ, pupæ, and eggs.

2. *Preliminary.*—Eggs.—The fruit of the banana is known to serve as a site for the deposition of the eggs in the tissue, and this to be used in the first instance as a guide to the action of the different contact-insecticides. As preliminary, therefore, and as pointing to the use of any insecticide, where the destruction of the eggs in other parts of the banana—e.g., in the suckers—is the object of investigation, there to be, in each such experiment, preliminary experiments of definite potencies, and of definite duration—where time is an element. The eggs are known to remain unhatched in the plant up to say three weeks, with apparently 10 days as a minimum, and observation, therefore, as to presence of issuing larvæ, etc., should be made at intervals during this period.

3. *Treatment of fruit on the plants* (as a guide to plantation treatment).—This to have reference to the following periods :—

(*a*) Prior to first appearance of adults thereon—e.g., Bordeaux mixture experiment as a deterrent.

(*b*) At times of first appearance of adults.

(*c*) Up to 12 days thereafter.

(*d*) When larval Thrips (nymphs) are first appearing, and thereafter as may suggest itself.

Where fluids are used, these to be administered with force consistent with fineness in application, so as to reach entire surfaces and penetrate obscure places in which the insects may reside.

4. *Treatment of Plants.*—

(*a*) Treatment of banana plants in the field, especially when young.

(*b*) Fumigation, especially of latter.

NOTE.—Field experiments in each case to follow smaller experiments.

5. *Treatment of Marketable Fruit.*—Fumigation.

6. *Treatment of Suckers.*—Guided by indications the outcome of preliminary experiments (*vid.* 2 eggs). Experiments to be carried out into the treatment of suckers with a view to rendering them quite free from Thrips presence.

These to involve the use of vessels (tubs, etc.) of adequate size.

In each case, also involving different insecticides, the duration of the procedure to be varied too in the several experiments.

This treatment of suckers to include not only fluid but gaseous and vaporous insecticides, especially the employment of Tobacco Blackleaf 40 (say, 1 oz. to 4 gallons). The observation of suckers treated over the entire period two to three weeks—involved in egg-hatching—to be made, and since any traffic in suckers from infested areas must involve the *certainty* that they are freed from all living Thrips insect, this work to be executed with the utmost care, in this even including the securing of suckers treated from re-infestation on the spot.

General "checks" to be used in all experiments.

HENRY TRYON,
Entomologist-in-Chief.
18th September, 1924.

A. A. GIRAULT,
Assistant Entomologist.

REPORT UPON AN INVESTIGATION OF BANANA "RUST," GYMPIE.*

BY A. A. GIRAULT.

(Plate 87.)

INTRODUCTORY.

In October, 1924, the writer was deputed by Mr. H. Tryon, the Entomologist-in-Chief, to investigate, under his instructions, the causal agent of what is called "Banana Rust"; and accordingly took station near Gympie where that affection is prevalent. Arriving on 8th October, 1924, a laboratory was established near Chatsworth where the affection is worst. The causal agent is a species of thrips. The following report, then, gives the details of the studies made of this insect and of measures for its control.

TIME OCCUPIED.

The investigation extended from 8th October, 1924, to 23rd February, 1925, when the writer returned to Brisbane. A few weeks previous to October had also been occupied in the study of this insect (at Gympie).

*A report covering special investigations during the period September 19–26 was submitted on the latter date. The observations and findings embodied in it are included here.—A.A.G.

PART I.—BIOLOGICAL.

ORIGIN AND NATURE OF THE AFFECTION.

Banana Rust is a leathering of the skin of the fruit due to its being fed upon by the young and adults of the insect in question. It is no doubt somewhat of the same nature as the "silvering" of the foliage and fruit caused by mites upon various plants, and is first manifested as a more or less oval brownish ring near the base of the younger fruits on the sides where they touch. Here the colony of thrips is first established and the ring is the outer boundary of it. This ring is a discolouration, a sort of "powdering," due to the fruits' skin being fed upon by the insects around the margin of the area they inhabit.

As the latter increase in number or enlarge their sphere of action, this more or less oval discolouration extends lengthwise and gradually may be diffused apex-wards over the whole side of the fruit or over the entire fruit. When this discoloured area has been "concentrated" upon it usually hardens and, as the fruit grows, the hardened part splits and becomes more or less corky in texture.

Observation has shown that it is only when the discolouration is extensive that any bad effects are produced. This dark area appears in marked contrast to the rest of the surface of the fruit and looks like a serious disease. The leathering effect gives the same impression. Moreover, it somewhat affects the quality of the fruit and no doubt causes premature ripening. The origin of the affection is intimately associated with the native home of the causal agent—the thrips. The latter attacks sugar, lady-finger, and plantain bananas as well as the Cavendish. The following has reference almost entirely to the latter.

THE SPECIES OF INSECT CAUSING THE AFFECTION.

The insect causing the affection is *Anaphothrips signipennis* (Bagnall, 1914) as identified by Mr. J. D. Hood, a specialist on this group of insects. It was described from a single specimen taken from the sheath of banana at Peradeniya, Ceylon. Both its larva and pupa are opaque white.*

OTHER SPECIES FOUND UPON BANANAS.

Two other species were found upon bananas in the Gympie district. One of these occurs with *A. signipennis*, has similar habits but is scarce. Its name is *Euthrips bilongilineatus* Girault. The second species is but very rarely found in the colonies of *signipennis* and seems to live as a scavenger. The species *bilongilineatus* is quite distinct in colour, has greenish yellow larvæ and pupæ. The second species, or rather third, is black, its larvæ red and its name is as yet unknown.

DISTRIBUTION OF THESE SPECIES.

The principal species, *signipennis*, was first discovered from Ceylon. In Queensland it is perhaps distributed along the North Coast and occurs all through the Mary Valley. The other two species, so far as is known, occur only about Chatsworth, Gympie. The species *signipennis* was not present in a collection of thrips taken in 1924 from bananas at Suva, Fiji (H. W. Simmonds, collector).

* The cause of rust was first discovered by Tryon (1912) but the previous history of the thrips is obscure.

HABITAT.

Wide search was made of miscellaneous plants in forest and jungle without success in finding the first two species; and so far all seem to be confined solely to the banana plant. Here they frequent solely the fruit and the pseudostem.*

It is a prevalent notion amongst the plantations that the black colouring seen upon the pseudostem, especially in the vicinity of the leaf-sheath, is a symptom of the thrips' presence, but observation does not confirm this, since this same colouring has been found to occur upon shoots not more than a month and a-half out of the ground and in plantations very sparsely infested. Moreover, this blackness was frequently found upon the exterior of the sheath where thrips never occur. It therefore seems to be natural to the plant.

The rusting is therefore the only symptom of the insect's presence and this occurs solely upon the fruit.

INSECTS LIABLE TO BE MISTAKEN FOR THRIPS.

On fruit and stem amongst or near the colonies, occur at least five species of Thysanura, all of which are characterised by their dark or party colours. One bluish species, however, when just moulted is very like thrips larvæ but its short, clubbed antennæ serve to distinguish it.

There are two species of mites, one white, the other red. In regard to the former, its rectangular body and quicker movement distinguish it. All of these animals either have different rates of movement or else appear different, and the experienced eye soon distinguishes them.

LIFE HISTORY STUDIES.

Anaphothrips signipennis (Bagnall).

General Habits.

This insect is perennial in its occurrence, being found in every stage throughout the four seasons. In the winter reproduction is merely retarded somewhat, as is development. The places on the plant inhabited by it are the pseudostem and the fruit. In these places they occur in colonies, and the adults in these colonies deposit their eggs under the skin of the plant at the site of the colonies. On the stem these colonies are always in dry places under the sheaths or along under the edges of the sheaths and occur from top to bottom without reference to exposure to the sun. On the fruit, they invariably occur near the base where the sides touch, rarely near the apex or along the entire side, and of course are always dry.

In the colonies, the insects slowly crawl about or remain quiet, feeding. When uncovered, they invariably crawl away in all directions, and their locomotion is considerably quicker in summer than in winter when it is slow and uniform. The adults in summer occasionally erect their wings and hop short distances with their aid but they have never been observed to fly. During the night there is no change of habit but, as the summer advances and the colonies increase, diurnal migration occurs from time to time,

* Garden plants were also searched unsuccessfully. But on 21st May, 1925, Mr. T. P. Reynolds told me, when on a short visit to Gympie, that on 18th May he had found *signipennis* upon tomatoes at Chatsworth. He then showed them to me and at the same time I found them upon this fruit on plants growing amongst bananas. They were causing "rust."—A.A.G.

mostly during the hottest part of the day. The migrating form is mostly the larva, for the adult is rarely seen exposed to direct light. The larva is active from the time it hatches. The pupa occurs within the soil and is able to crawl slowly. Migration was first noticed late in November; the accelerated locomotion on 19th September.

It is seen from what has been written that this insect is practically a stationary one, slow of movement, non-flying (so far as known), always present, active and reproductive. Neither the nymph nor adult curls the body when in locomotion.

GENERAL LIFE HISTORY.

The adult upon changing from the pupa remains in the soil a day or so and then crawls to the surface and on to a banana plant. Here, if a female, it is courted and mated within the week, has already been feeding and soon commences laying eggs. These, as has been stated, are deposited into the skin of the plant, on stem or fruit. A relatively very long time elapses now before hatching occurs, on the average about two weeks, and when this takes place the resulting larva at once crawls away a short distance and commences to feed. It grows rapidly and within eight days is ready to leave the plant, descend to the soil, and pupate. It first spends a day or so within the soil, then transforms loosely, that is without making a cell, first as a short-winged pupa, then as a long-winged pupa and within from six to eight days is again an adult.

THE EGG.

Description and Oviposition.

The egg is so small and delicate that without making sections of the plant it has been impossible to describe its appearance and shape. However, it has the general appearance of the plant cell, and doubtless does not differ materially from the eggs of other species of thrips. It is deposited into the soft tissues of the stem and fruit, and is very difficult to dissect out. The place of deposit is very frequently unmarked in any way, but in the fruit, frequently, minute round pustules are formed over the egg and the larva hatches from a minute slit to one end of the centre of this pustule.

Oviposition is very simple and direct, the female merely selecting a place, inserting the ovipositor and passing the egg through. It does not take more than fifteen minutes, but these observations are fragmentary and the insect's habits make it difficult to observe.

Sites of Oviposition.

Eggs may be deposited at any covered place on the stem or fruit but as a rule they are placed within or near the colonies. The following actual places of hatching on the fruit have been observed:—

1. From a pustule, half-way from middle to apex, near one angle.
2. From a half-grown fruit, 1½ inch from base of fruit.
3. "After hatching a minute hole is left in the surface of the fruit or stem, but the site of oviposition is not distinguishable nor characteristic."
4. From side very young fruit just beyond middle; from about 1 inch from base; and from side near apex (small, undeveloped, "tip" fruit). In the latter case, a brown-yellow spot marked the place of deposition.
5. From side, 1 inch from base. Round about were a dozen hatching sites, all within brown specks as was the first.

6. From middle of side, 2 inches from base—from a round, brown speck. Similar specks were dotted all over the fruit (a young "white-tip," badly infested with adults) but densely so only upon this (flat) side.

7. Two from middle of side, 2 inches from base.

8. From side of ripe fruit towards middle from base. No pustule but a discoloured spot.

From these chance observations, it seems that most of the eggs are within the basal half of the fruit as would be expected. They show also that the egg site may be unmarked, or within a pustule or within a brown spot. The pustule is small, round, brown, usually surrounded by a narrow, irregular rim of lighter brown (dead tissue). The emergence hole is toward the margin. The brown spots on the surface from which larvæ have hatched have no rim. When ovipositing the female leaves no perceptible mark.

Duration of the Stage.

A large amount of data in regard to this were gathered, but, owing to the fact that the eggs are concealed and the insect so shy, it was necessary to resort to keeping lots of infested bananas and, after recording the date they were picked, make frequent observation of them until all hatchings ceased. The instar was then taken to be the period between the date of picking and the date of last hatching. As it sometimes happened that fruit used for this purpose bore eggs some days old, a very much shorter period was obtained than usual and these cases were not recorded. Usually several lots were run together, and the data may therefore be considered as accurate as it is possible to obtain them. The data are tabulated as follows :—

Duration of Period of Embryonic Life.

Lot.	Fruit Picked.	Hatchings.	Duration, Days.	Average.
1	Oct. 14 (♀ on fruit)	Oct. 30	16	..
2	Oct. 17	Oct. 23, 27, 31, Nov. 3	17	..
3	Oct. 29	Nov. 3, 4, 6, 12	14	..
4	Oct. 29	Oct. 31, Nov. 3, 6, 10, 12	14	..
5	Oct. 29	Nov. 10, 12	14	..
6	Oct. 29	Oct. 31, Nov. 3, 7, 8, 10, 14	16	15·1
7	Nov. 3	Nov. 6, 8, 10, 11, 14, 17, 18, 19, 21, 22	19	..
8	Nov. 3	Nov. 12, 14, 17	14	..
9	Nov. 3	Nov. 4, 10, 12, 13, 14, 16, 21	18	..
10	Nov. 3	Nov. 17	14	..
11	Nov. 20	Nov. 28, 29, Dec. 1,2, 3, 5, 6	16	..
12	Nov. 24	Nov. 25, 29, Dec. 10	16	..
13	Nov. 24	Nov. 26, 27, Dec. 1, 2, 3, 5, 8, 10, 11, 13	16	..
14	Nov. 24	Dec. 9	15	..
15	Nov. 26	♀ confined. Larvæ out Dec. 10	14	..
16	Dec. 1	Dec. 4, 9, 11, 12, 15	15	15·6
17	Dec. 1	Dec. 13, 14, 16	16	..
18	Dec. 2	Dec. 4, 8, 10, 11, 12, 13, 15	13	..
19	Dec. 2	Dec. 15	13	..
20	Dec. 2	Dec. 17	17	..
21	Dec. 4	Dec. 11, 19	15	..
22	Dec. 4	Dec. 11, 13, 20	16	..
23	Dec. 4	Dec. 6, 8, 9, 11, 15, 16, 19	15	..
24	Dec. 8	Dec. 24	16	..
25	Dec. 8	Dec. 15, 19, 22, 23, 24, 26	18	..
26	Dec. 10	Dec. 12, 15, 18, 19, 24	14	..

DURATION OF PERIOD OF EMBRYONIC LIFE.—*continued.*

Lot.	Fruit Picked.	Hatchings.	Duration, Days.	Average.
27	Dec. 10	Dec. 25	15	..
28	Dec. 11	Dec. 26	15	..
29	Dec. 12	Dec. 7	15	..
30	Dec. 12	Dec. 29 approx. (reared)	16	..
31	Dec. 15	Dec. 19, 22, 26, 29, 30, 31 ..	16	..
32	Dec. 20	Dec. 26, 29, 30, 31, Jan. 1, 2, 4, 5 ..	16	..
33	Dec. 23	Dec. 25, 26, 31, Jan. 2, 5, 7, 8, 9 ..	17	..
34	Dec. 31	Jan. 10, 12, 14, 16	16	..
35	Dec. 31	Jan. 2, 5, 6, 7, 8, 10, 12, 14, 16 ..	16	..
36	Dec. 31	Jan. 10, 14	14	..
37	Dec. 31	Jan. 16	16	15·4
38	Jan. 6	Jan. 8, 12, 14, 16, 17, 19, 20, 21 ..	15	..
39	Jan. 7	Jan. 10, 16, 17, 19, 21	14	..
40	Jan. 7	Jan. 12, 16, 17, 19, 20	13	..
41	Jan. 8	Jan. 10, 12, 14, 19, 20	? 12	..
42	Jan. 8	Jan. 19, 21	13	..
43	Jan. 8	Jan. 12, 14, 16, 17, 19, 21	13	..
44	Jan. 8	Jan. 12, 14, 16, 17, 21	13	..
45	Jan. 9	Jan. 12, 14, 16, 17, 19, 21, 22	13	..
46	Jan. 13	Jan. 17, 21, 22, 24, 26	13	..
47	Jan. 13	Jan. 16, 17, 19, 21, 22, 23, 24, 26, 27..	14	..
48	Jan. 15	Jan. 21, 23, 24, 26, 28, 30	14	..
49	Jan. 16	Jan. 22, 26, 28, 30	14	..
50	Jan. 23	Jan. 24, 25, 26, 27, 28, 29, 30, 31, Feb. 3, 4, 5, 7	15	..
51	Jan. 23	Jan. 26, 28, 30, Feb. 1, 3, 5	13	..
52	Jan. 29	Jan. 30, Feb. 1, 3, 5, 7, 9, 11	13	..
53	Jan. 29	Jan. 30, 31, Feb. 1, 3, 5, 7, 9, 11, 12 ..	14	13·5
54	Feb. 4	Feb. 17	13	..
55	Feb. 5	Feb. 17	12	12·5

Average of the whole, 14·4 days.

There is a decided decrease in the period as the summer advances. It varies from 12 to 19 days. The majority of the data was taken from the fruit.

EGGS NOT DEPOSITED INTO CORMS.

As this has considerable practical bearing, in view of the fact that suckers are transferred from one place to another, the following observations in reference to it were made.

In the first place, the corm as a rule is under ground and larvæ have never been found under ground upon the plant. Nor have pupæ been found upon the plant, nor do adults resort to underground parts of the plant.

In the second place the tissue of the corm is much tougher than that of the fruit or stem.

As it was thought unnecessary to make extensive observations, the following data were considered sufficient to establish that the insect did not breed in or upon the corm.

1. Twelve suckers were dipped for thirty minutes in Black Leaf 40, 20th September, 1924, and the pseudostems removed. They were dried and after a day wrapped in paper and frequently examined. Up to 26th September, when the experiment had to be discontinued, nothing had hatched, but living mites and coleopterous larvæ were found within and upon the corms. A single control gave similar results.

On 3rd October three pieces of corm were cut from a badly infested stem and kept for observation. There were no hatchings up to 24th

November, the pieces then dry ; as a control, pieces of the stem yielded 40 larvæ up to 22nd November.

On 27th October fourteen slices of corms were made from infested stems and kept for observation, with negative results, up to 24th November. A similar result was obtained from three more slices taken the same date but kept as a separate lot.

On 29th October three slices of corm from infested stools were kept until 24th November with negative results.

On 23rd January, 1925, three more slices of the corm were made from badly infested plants. No hatchings resulted up to 16th February. And so with ten more pieces of a separate lot, same date.

These lots were all controlled by pieces of infested stem which always produced larvæ.

It is noticeable that, when larvæ are confined with fresh pieces of corm and stem mixed together, they choose the latter and remain upon it.

OVIPOSITION IN REGARD TO AGE OF FRUIT.

Larvæ have been hatched from every size and age of fruit, and the female will attack the Cavendish banana as soon as the bracts are loose enough for it to gain entrance.* Even those fruits which set but do not develop and which are present upon the end of the bunch receive eggs. The mature fruit also receives them but the younger fruit is the most favoured, as are also the basal hands. There seems to be no favoured place upon the pseudostem.

THE LARVA.

HATCHING.

This is quite an ordinary act. The nymph simply pushes its way through the skin of the stem or fruit, erect, casting the very delicate amnion as it does so. It remains erect until its appendages are freed, whereupon it drops to the surface and by the aid of its legs gradually withdraws the remaining few segments of the abdomen and crawls off. The time taken is about twenty minutes. The cast amnion remains to mark the hatching site, as a minute, hairlike, semi-prostrate white thread ; it is sometimes erect. There is also a minute cross-slit, the exit hole. Thus the minute slit with projecting amnion indicates where eggs have been and can be recognised in the colony.

Hatching occurs at any time of the day or night, but, as the following observations show, usually it is regular and confined to a definite period. This is between the hours of 6 and 11·30 a.m. Of separate observations, the following were noted in the morning and afternoon :—

Chance Observed Hatchings—Time.

A.M.	P.M.
48	2

Thus, out of 50 chance observations, 48 were in the morning, classified as follows :—8 a.m., 1 ; 8·30 a.m., 5 ; 9 a.m., 11 ; 9·30 a.m., 7 ; 10 a.m., 5 ; 10·30 a.m., 2 ; 11 a.m., 10 ; 11·30 a.m., 7. Of the two P.M. observations, one was at 1 o'clock and one at 12·30 p.m.

*After the first bract is loose, access to the rest of the bunch is possible as Mr. S. Ukran demonstrated. This will be understood by examination. Adults have been found, at this stage, to have penetrated to the fourth hand.

The following observations were made particularly in reference to the time of hatching and are tabulated :—

TIME OF HATCHING AS OBSERVED FROM TWENTY FRUITS. JANUARY 1925.

Hour:	6 a.m.	11 a.m.	6 p.m.	10 p.m.
Larvæ	10	228	8	8
Total	..	.. 254		

The observations were continuous over a week and were made at the four hours indicated. Thus 228 out of 254 hatchings occurred between 6 and 11 a.m. This is 89 per cent.

DURATION OF THE STAGE.

The larvæ take less time to develop than do the eggs, as the following table shows. This records but the actual growth of the larva, which is more rapid than one would suppose.

DURATION LARVAL STAGE, DAYS.

Hatched.	Number of Larvæ.	Mature.	Left Fruit.	Duration, Days.
Oct. 25	5	Oct. 31 ..	Nov. 1 ..	8
Oct. 25	2	Nov. 3 ..	Nov. 4 ..	10
Oct. 29	4	Nov. 4 ..	Nov. 6 ..	7
Oct. 31	4	Nov. 8 ..	Nov. 9 ..	9
Oct. 30	2	Nov. 4 ..	Nov. 6 ..	7
Nov. 5	3	Nov. 10 ..	Nov. 12 ..	9
Nov. 10	2	Nov. 17 ..	Nov. 18 ..	8
Nov. 13	Many	Nov. 19 ..	Nov. 20 and later	7
Nov. 29	5	Dec. 5 ..	Dec. 6 ..	7
Dec. 4	4	..	Dec. 13 ..	9
Dec. 18	Several	Dec. 26 ..	..	8
Jan. 12	2	Jan. 17 ..	Jan. 20 ..	8
Feb. 14	5	Feb. 19 ..	Feb. 20 ..	6
Feb. 3	2	Feb. 9 ..	Feb. 10 ..	7
Averages	3⅓	..	..	7·8

The rapidity of growth is shown by the following instances. Of the five larvæ hatching 14th February, four were submature four days later ; a larva hatching 22nd October was five-sixths grown on the 27th. Four larvæ hatching 31st October were submature 6th November and one-third grown on 3rd November. Growth, of course, is uneven. Thus, five hatching 29th November were half-grown on 3rd December but by the 5th two were mature, two were two-thirds grown, and one only half-grown. This unevenness is due largely to delay at the moult.

DURATION OF PREPUPAL STAGE.

This was taken as commencing from when the larva leaves the frui to enter the soil. Not many records were obtained, owing to the fact that after entering the soil the larvæ are most frequently lost sight of. Two larvæ entered the soil 19th November and pupated 23rd November, the period being in this case four days. In a second instance a larva matured

and left the fruit on 3rd February. The pupa was present on the fifth, a period of two days. In a third case, four larvæ entered the earth on 20th November and three of them were observed to pupate on 23rd November, the fourth on 24th November, periods of three and four days respectively. A fourth case: Larva entered soil 20th November, pupated 24th November, or in four days. A fifth case was unusual in that the larva did not enter the earth. It left its food on 6th November and was still present on the surface 10th November, pupating the 11th or after five days. Sixthly: Left food 27th November; 28th November against glass of container, two inches below the surface; pupa on 1st December or after five days.

A seventh observation was obtained from four larvæ reared from the egg. On 10th November they left their food and one remained in view, pupating 14th November, or after four days. The average period is: (4, 2, 3, 4, 4, 5, 5, 4, plus two 3's of case 3), 3·7 days, and ranges from 2-5.

Duration of the Entire Larval Period.

This is obtained by adding the averages of the aerial and underground lives of the larva and is found to be 11·5 days. The larval period is therefore considerably less than that of the egg, usually the contrary in most insects.

Ecdysis.

This has never been observed except in one instance and very likely takes place at night. As with most or all of the species of its order there is but the single moult. The instance observed was this: A female was taken from a banana plant on 26th November, 1924, and kept in confinement with an uninfested fruit. Larvæ from this mother commenced hatching on 10th December. On 13th December, the female was transferred to a separate vial and the larvæ over soil. Larvæ continued to hatch from the fruit which was rather crowded with them. On 29th December, a colony of them (10) which had hatched on 26th December were found to have just moulted into stage II. They were then about half-grown. The moulted skins were long white threads scattered amongst the young and they have never been observed before or since as recognisable objects.

Larvæ—Descriptive.

The larvæ of the three species differ considerably when closely examined. The following table will not only describe them but also allow them to be identified:—

1. Colour red. Spines both simple and capitate, not numerous, elongate. Antennæ 7-jointed, blackish, also the legs and apical segment. Eyes near base antennæ, of latter 3-4 longest, clavate. Several slender, very elongate spines from apex abdomen. No transverse joints in antennæ. Mature. *Black sp.*

2. Colour white or pale yellow. Antennæ 10-12-jointed, with 6 more or less transverse joints.

   Spines numerous, simple, elongate, several on head; colour pale yellow; joints of antennæ distad of the mass of 6 transverse, solid, acuminate, subequal to the six preceding. Antennæ 10-jointed. Spines usually in cross-rows. Leg setæ longer. Antennal 2 dusky. Eyes dark. Like next. Mature, *bilongilineatus* Girault.

Spines sparser, mostly lateral, dorso- and ventro-lateral lines, mostly funicular or clubbed; opaque white, eyes dark red; joints of antennæ distad of the six transverse, 3, antennæ 12-jointed, 1 wider than long, 2 a bit longer than wide, 3 cup-shaped, united equal next 6 which compose an ovate mass equal to 3 distal; 10-12 a long acumination; of 6 transverse joints, first and last (4 and 9) are longest; 10 a bit wider than long, 11 twice longer than wide, narrowing; 12 is twice 11. Setæ sparse; elongate distad (antennæ), on abdomen short and funnel-shaped or subcapitate, on lateral line 1 per segment, but at apex becoming elongate and simple. Young, first stage, *signipennis* Bagnall.

In the mature larva of *signipennis* the eyes are closer to middle of side of head and it otherwise differs from stage I. in size, funicle 3 is ovate and distinctly longer than 2. In both stages there is a disk-shaped, cellular, dotted area on thorax II., cephalo-laterad just behind a single funnelform, long hair on I. Another of these is just in front of the antepenultimate lateral funnelform hair. A third is upon the dorso-lateral aspect of abdomen just mesad of the first lateral capitate hair; the other two are lateral. Of the lateral line of funnelform or subcapitate hairs on the abdomen there are 8, one to each segment, lengthening in succession.

Observation upon Migrating Form.

On 15th January, many young were observed at 10·30 a.m. exposed in the open upon the pseudostem. Some were stationary, others crawling about (in shade). There were no adults. Their movements were leisurely and apparently without direction; it is local, that is, confined to the plant and not from one plant to another.

THE PUPA.

This is found within the ground as the following observations show:— Quite a large amount of digging was done before 16th December when the first pupa was found in red earth surrounding an infested stool. Here four were located after some time, three short-winged and one long-winged, all from 4½-6 inches below the soil surface, taken as being level with the stool; but, as the soil sloped away from the base of the plants, the actual depth from the surface was only about 3 inches. The distance from the nearest plant was about 3 inches. These pupæ were "loose" within the soil, i.e., not in cells.

On 23rd January, 1925, a second successful hunt for pupæ was made. There had been several days of steady rain, the soil therefore wet to the surface. Digging was first done under an infested bunch on a hillside (and some distance away from the plants) to a depth of 4 inches but without success. Then under an infested stool, near its base, also unsuccessfully. Then under the base of a smaller infested stool, the soil sloping from it and covered with ¾-inch of rock fragment. Under these stones the earth was wet, black (much dead vegetable matter), and scanty since much rock was also within it. Here within 1–2 inches of the surface four pupæ were uncovered; these were from 3-3½ inches below the level of the soil through base of stool and but several inches from the plant. The pupa (long-winged) is free and can crawl slowly.

On 6th February, 1925, a third successful hunt. It was then raining. A pupa was found as soon as digging was started, as usual, loose within the soil. It was within an inch of the surface and 2 inches from base of stool.

Pupæ have never been found upon any part of the plant, but, as they occur in the soil, suckers might possibly carry them, and it is conceivable that they might frequently be found adhering to the corm. But, as with hundreds of larvæ in confinement, only one ever transformed outside of the earth, and, as they have never been seen in "nature" outside of the earth, this is not likely, more especially as they seem to require at least an inch of soil.

DURATION OF PUPAL STAGE.

This includes the time from actual pupation to transformation to the adult.

Lot.	Date Pupated.	Number.	Date Adult Disclosed.	Duration, Days.
1	(The black species) Nov. 11 ..	1	Nov. 17 ..	6
2	Nov. 11	1	Nov. 17 ..	6
3	Nov. 24	2	Dec. 2 ..	8
4	Nov. 23	5	Dec. 1 ..	8
5	Nov. 27	3	Dec. 5 ..	8
6	Nov. 24	1	Dec. 2 ..	8
7	Dec. 1	1	Dec. 11 ..	10
8	Dec. 11	5	Dec. 18 (avg.) ..	7
9	Dec. 7	4	Dec. 15 (avg.) ..	8
10	Dec. 24	3	Dec. 31 ..	7
11	Feb. 5	1	Feb. 13 ..	8
	Average	..	..	7·6

DURATION OF THE POST-PUPAL ADULT STAGE.

After transformation, the adult remains a short period within the soil. Not many records of this were obtained, as to obtain them would require very close watching. However, at 3 p.m. on 1st December, a pupa in the soil and visible through the container was noted to be colouring up (pale yellow, ocelli pink, eyes ruby) as when ready to transform. It did so at about 6 a.m. 2nd December, and left the soil at 3 p.m. or after 9 hours. In a second case, the pupa transformed on 11th December and left on 12th December. This period rarely, I think, exceeds 24 hours; at least it is much shorter than the prepupal larval period.

DURATION OF THE PERIOD OF UNDERGROUND EXISTENCE.

This is obtainable by adding together the prepupal, pupal, and post-pupal stages and is 12·3 days on the average. The following observations have also been made:—

Larvæ Entered Soil.	Adults Emerged.	Days.
Dec. 18	Jan. 2	13
Nov. 6	Nov. 17	11
Nov. 28	Dec. 12	14
Nov. 24	Dec. 5	11
Dec. 4	Dec. 14	10
Nov. 20	Dec. 2	12
Dec. 6	Dec. 18	12
Feb. 3	Feb. 13	10
Average: (Variation 4 days) ..	..	11·6

The average of the two results is 11·9 days.

DURATION OF THE TWO PUPAL STAGES.

This was also rarely observed :—

Pupated.	Moulted.	Adult.
Dec. 11	Dec. 13	..
Dec. 24	Dec. 26	Dec. 31
Jan. 4	Jan. 6	Jan. 11
Feb. 5	Feb. 7	Feb. 13

Thus, the short-winged or first pupal stage seems to be the shorter of the two by some days, occupying, in these few cases, 2 days out of 7 or 8.

DESCRIPTIVE.

The pupa is white and has two distinct stages, a long- and short-winged. When it is about to moult into the second stage, it turns yellowish, and again when it is about to transform to the adult, when the wing-cases also darken and the eyes and ocelli are more or less reddish. In the first stage, the antennæ are directed forward as in the larva, but in the second they are drawn back over the frons and directed caudad between the eyes, not quite reaching the caudal end of the pronotum. The elongate, narrow wing-pads then reach to about apex of segment 6 of the abdomen, and the apex of the latter at dorsal margin bears four semi-erect spines directed dorso-caudad.

THE ADULT.

The adult stage is the longest, then the egg.

COURTING AND MATING.

On the banana plants, when colonies are uncovered, occasionally mating pairs are observed, and these crawl away as rapidly as do the others, the larger female dragging the smaller male after it. Less frequently, a female is observed with a male clinging to its abdomen with the forelegs, the head over the abdomen's dorsum, and both bodies in a straight line. This is the position of courting and, of course, precedes mating. It lasts at least 15 minutes and very likely much longer. During the latter, the pair are end to end and the union is at the base of the ovipositor.

After emergence from the soil, the adults at first pay attention to themselves *per se* and engage in feeding. How soon mating and oviposition commence is a bit uncertain, but the following observations upon colonies in confinement probably show the actual state of things :—

(1) A pair emerging 12th December were confined upon a green banana (fruit) and kept under observation. Courting was observed on 19th December or after a week.

(2) On 16th December, in a tube, four adults emerged ; on the 22nd 11 had emerged; 26th, 25 were out; on 29th, a pair was observed mating, or within 13 days.

(3) On 6th December 4 adults emerged. Three days later, a female was ovipositing !

(4) Adults emerging 6th December were courting on the 12th, or within 6 days.

(5) Adults which emerged 3rd December were courting 8th December and mating 11th December ; mating occurred within 5 days, since it follows courting.

(6) On 22nd December in a tube 5 adults emerged and by the 29th there were 10. Courting was observed not until 6th January.

(7) In another tube adults emerged 20th December and a courting pair was observed on 31st December, or within 11 days.

(8) Fifteen males and females emerged on 8th February, and on the 13th two pairs were observed courting.

(9) On 31st December three adults emerged and by the 12th 63 were out, including two courting pairs.

It appears from these observations that courting and mating usually occur within the first week after emergence from the soil, but mating is not necessary so that oviposition may occur within less than that time. For other observations see next section.

PARTHENOGENESIS.

This was suspected in view of the paucity of males as shown later. The following observations seem to prove it :—

(1) On 1st December, 1924, a female emerged in a tube, the sole adult. Larvæ appeared 18 days later. Oviposition, then, occurred within 3 days.

(2) On 2nd December a similar case occurred in another tube and larvæ appeared after 20 days.

(3) On 3rd February two females emerged in another tube and were confined together with a banana picked that day. Larvæ commenced to hatch from the fruit on 16th February and continued until the 21st, when the cage was broken up. So far as is known no males were present with the females. Oviposition must have commenced within 3 days. The fruit was uninfested.

(4) A female was reared from a number of larvæ on 1st December, the only adult to emerge. It was kept under observation. The first larvæ appeared on 18th December and continued until 13th January, or until the fruit rotted away. Virgin oviposition commenced within 3 days of emergence, and the adult continued to reproduce until it died on 30th January.

PROPORTION OF THE SEXES.

The males are considerably less in number than the females, as the following two tables show :—

PROPORTION OF THE SEXES, PSEUDOSTEM. SEPTEMBER 25, 1924.

Number Counted.	Males.	Females.	Per Cent.	
			♂	♀
100	44	56	44	56

The following table is given for comparison :—

PROPORTION OF THE SEXES, PSEUDOSTEM AND FRUIT. FEBRUARY 18, 1925.

PSEUDOSTEM.			FRUIT.		
Number Counted.	Per Cent.		Number Counted.	Per Cent.	
	♂	♀		♂	♀
100	34	66	100	32	68

Thus, later in the season, the males were even more scarce but the relative number on the fruit was about the same as that on stem. During July 1924, of 751 adults taken at random (J.H.S. and A.A.G.), 80 per cent. were females ; at the same time, of 338 adults noted from the fruit, 77 per cent. were females. In another lot of 152 adults, 87 per cent. were females. This upon the fruit.

Duration of the Stage.

The adults live a much longer time than was expected. The following table gives the time they lived in confinement, but as their food sometimes dried up, despite frequent attention, some of the records are incomplete. Accidents were also rather frequent, due to the nature of the insect and the difficulty of (always) keeping the containers dry.

Table showing Duration of the Adult Stage.—Laboratory.

Date Confined.	Remarks.	Sex.	Died.	Duration, Days.	Maximum.	Minimum.	Average.
1924.							
Oct. 14	..	♂	Nov. 4	21	..	..	..
		♀	Nov. 12	29	..	..	..
	Drowned ..	♂	Nov. 19	36	..	..	..
Oct. 17	..	♂	Oct. 20	3	..	3	..
		♂	Oct. 24	7	..	..	..
	..	♂	Nov. 7	21	..	..	..
		♀	Nov. 23	37	..	..	..
		♀	Dec. 24	68	..	..	..
Oct. 29	..	♂	Nov. 21	23	..	..	..
		♂	Nov. 21	23	..	..	..
Nov. 4	Killed by accident	♂	Nov. 25	21	..	..	..
Nov. 6	Food dried ..	♀	Dec. 8	32	..	..	..
Nov. 12	Escaped ..	?	Nov. 27	15	..	..	..
		♀	Dec. 7	25	..	..	..
Nov. 12	..	♂	Nov. 26	14	..	..	..
Nov. 13	Escaped ..	♀	Nov. 27	14	..	..	..
Nov. 26	..	♀	Jan. 13	48	..	..	..
Dec. 1	Drowned ..	♂	Dec. 26	26	..	..	..
	Escaped, reared	♀	Jan. 30	61	..	..	..
Dec. 6	..	♀	Jan. 8	33	..	..	..
Dec. 5	Reared ..	♀	Feb. 3	60	..	..	..
Dec. 6	..	♀	Dec. 24	18	..	..	..
Dec. 6	Terminated ..	♀	Feb. 16	72	72	..	..
Dec. 10	Reared, drowned	♂	Jan. 20	41	..	..	..
	Reared ..	♂	Dec. 15	5	..	..	..
Dec. 9	Escaped ..	♀	Dec. 29	20	..	..	..
	Escaped ..	♀	Jan. 21	43	..	..	..
Dec. 12	..	♂	Dec. 22	10	..	..	..
		♀	Dec. 22	10	..	..	..
Dec. 11	..	♀	Jan. 21	41	..	..	..
		♀	Feb. 5	56	..	..	..
	Killed by accident	♂	Jan. 19	39	..	..	..
		♀	Feb. 6	57	..	..	..
Dec. 15	Terminated Black Sp.	♀	Feb. 16	63	..	..	..
Dec. 15	Food rotted. ..	10 ♂♀	Jan. 12	28	..	..	..
Dec. 16	*bilongilineatus*	♀	Jan. 22	37	..	..	..
Dec. 14	Escaped ..	?	Jan. 28	48	..	..	..
Dec. 15	Reared ..	♂	Dec. 24	9	..	..	..
	Reared ..	♂	Dec. 28	13	..	..	..
	Reared ..	♂	Dec. 28	13	..	..	..
Dec. 16	Terminated ..	♀	Jan. 12	27	..	..	..
Dec. 21	Reared ..	♀	Jan. 6	16	..	..	..
Dec. 22	Terminated ..	♀	Feb. 16	56	..	..	..
		♀	Jan. 7	16	..	..	..
		♀	Jan. 11	20	..	..	..
		♀	Jan. 12	21	..	..	..

TABLE SHOWING DURATION OF THE ADULT STAGE.—LABORATORY—*continued.*

Date Confined.	Remarks.	Sex.	Died.	Duration, Days.	Maximum.	Minimum.	Average.
Dec. 25	Reared ..	1 ♂ ♀	Jan. 14	20	..	..	..
	Reared ..	♀	Jan. 15	21	..	..	..
	Reared ..	♂	Jan. 15	21	..	..	..
1925.							
Jan. 3	..	♂	Jan. 18	15	..	..	..
Jan. 14	Terminated ..	♀	Feb. 16	33	..	..	..
Jan. 16	Terminated ..	♀	Feb. 16	31	..	..	..
Jan. 17	Terminated ..	♀	Feb. 16	30	..	..	..
Jan. 20	..	♀	Feb. 1	12	..	..	..
		♂	Jan. 30	10	..	..	..
Jan. 22	..	♀	Jan. 30	8	..	..	..
		♀	Feb. 13	22	..	..	..
Jan. 24	Terminated ..	♀	Feb. 16	23	..	..	..
Jan. 26	Terminated ..	♀	Feb. 13	18	..	..	..
Feb. 3	Reared ..	♀	Feb. 21	18	..	..	..
	Reared, terminated	♀	Feb. 16	13	..	..	..
Feb. 4	Reared ..	♀	Feb. 21	17	..	..	..
				2,008			27·8

From the above it is seen that the average length of life is about four weeks but it is no doubt somewhat greater, since the real length was not obtained (but shortened) due to accident and so forth in many cases, as is duly noted above. The adults always have to have food as the next shows. Of those adults taken from bananas, the length of life was certainly greater than recorded, at least by a day or two.

DURATION OF ADULT LIFE WITHOUT FOOD.

Only a few records were obtained, for the reason that they invariably showed the same result—namely that, without food, life is very short. This applies as well to the larval forms.

On 14th October, a number of young (larvæ) and adults were taken from the pseudostem of a banana plant, 11 a.m., and placed into a dry, corked vial. By 2 p.m. most of them were dead.

On 3rd November in the morning, 4 adults were taken from plants and each confined within a dry vial plugged with cotton. They were dead by p.m. 4th November.

TABLE SHOWING DURATION LIFE SANS FOOD, MOIST AND DRY ATMOSPHERES, 1924.

Conditions.	Date Confined.	Died.	Length, days.	Average.
Dry. No. 1 ..	4 p.m., Nov. 17	7 a.m., Nov. 18	½ +	..
	7 a.m., Nov. 18	8 a.m., Nov. 19	1 +	..
	8 a.m., Nov. 19	8 a.m., Nov. 20	1 +	..
	8 a.m., Nov. 20	8 a.m., Nov. 21	1 —	—1 day
	3 p.m., Nov. 21	8 a.m., Nov. 22	½ +	..
	8 a.m., Nov. 22	7 a.m., Nov. 23	1 —	..
	4 p.m., Nov. 24	3 p.m., Nov. 25	1 —	..
Moist. No. 2 ..	4 p.m., Nov. 17	8 a.m., Nov. 19	1½	..
	8 a.m., Nov. 19	p.m., Nov. 20	1½	..
	3 p.m., Nov. 21	8 a.m., Nov. 23	1½	1·4 days
	4 p.m., Nov. 24	3 p.m., Nov. 25	1 —	..
Food, control. No. 3	4 p.m., Nov. 17	7 a.m., Nov. 18	½ +	..
	7 a.m., Nov. 18	3 p.m., Nov. 25 (terminated)	7¼	3·87 days (up to time of termination)

Thus, for a number of cases life ceased within a day after food was withdrawn or within a day and a-half, according to the state of the atmosphere. Dryness seems to be as fatal as lack of food, or rather dryness makes the lack of food the more quickly fatal. Adults kept with slices of tender corn plants lived for several days, but they did not seem to establish themselves upon this food.

Duration of Life according to Sex.

This may be computed from the foregoing table, and is as follows :—

In the case of the male, 21 lived a total of 391 days or 18·6 days ; 38 females lived a total of 1,209 days or 31·8 days each. The female lives a considerably longer time. In respect to this it is noteworthy that most of the records of longest life are of females. Thus of all records over 40 days, amounting to 12, all except one were females.

Duration of the Life Cycle.

This is obtainable in two ways: (1) By rearing or (2) by computation—adding the stages together. The latter will be done first. The sum of the averages of all developmental stages is 33·9 days. (This includes the average egg stage, the average larval existence above and below ground, and the pupal and postpupal stages.) The maximum is 40 and the minimum 24 days.

The maximum length of life was 112 days and over half of this was adult ; the minimum was 27 days.

The following observations were made in regard to the second method :—

A female was depositing eggs on 26th November. These hatched 10th December, emerged 31st December as adults, a cycle of 35 days.

Two adults were ovipositing on 12th December, 1924 ; these eggs hatched on 29th December, 1924, pupæ were present on 14th January or earlier, and adults on 19th January 1925, a cycle of 38 days.

On 16th December, four adults emerged having been reared from larvæ confined on 1st December. These were given fruit and confined over soil. The second generation of adults commenced emerging on 14th January, 1925, or a cycle of 29 days. These were males, as were all of the rearings, in confinement, to the second generation.

On 3rd November, 1924, a banana was confined and larvæ commenced to hatch at once. Adults appeared from these on 2nd December, 1924, or after 29 days.

Eggs deposited about 8th December, 1924, by reared adults yielded a male on 13th January, 1925, a cycle of 36 days ; several other males of the second generation emerged the next day.

Direct rearings give an average cycle of 33·4 days, ranging from 29-38 days. An additional record was from 6th January to 7th February, 1925, or 32 days.

Number of Progeny.

Observations upon this were necessarily broken owing to the impossibility of giving very close continuous attention to the indoor work and to the quantity of the latter. Also, it frequently happened that the fruit containing many eggs would rot away before hatching occurred, and thus the records came to be but fragmentary. They are tabulated for convenience in the following table :—

Table showing Partial Record of the Descendants of One Female.

Dates.	Larvæ Hatching.	Total.	Average.	Remarks.
Oct. 29-Dec. 6 ..	44	44	..	34 adults.
Nov. 26-Dec. 28 ..	102	102	..	63 adults.
Dec. 6-Feb. 16 ..	84	84	..	At least one fruit full of eggs rotted away.
Dec. 1-Feb. 13 ..	55	55	..	Average 2 ♀'s. Some young killed by decaying fruit.
Dec. 11-Jan. 28 ..	26	26	..	..
Dec. 11-Feb. 3 ..	55	55	..	At least many lost by decay of fruit.
Dec. 12-Jan. 30 ..	67	67	..	..
Dec. 12-Jan. 16 ..	45	45	59	Average 2 ♀'s.

Length of the Period of Oviposition.

This is about as long as the life of the adult and continues to a day or so before death. The following actual observations were made :—

Duration Period of Oviposition.

Lot.	First Eggs Deposited.	Last Eggs Deposited.	Duration, Days.	Average.
1	Oct. 30	Dec. 3	34	..
2	Oct. 14	Nov. 12	29	..
3	Nov. 26	Dec. 13	17	..
4	Dec. 1	Feb. 3	64	..
5	Dec. 6	Feb. 3	59	..
6	Dec. 11	Jan. 13	33	..
7	Dec. 7	Jan. 3	27	37

The Rate of Oviposition.

Several lots of adults were confined especially to determine the average number of eggs deposited daily, and some observations were obtained incidentally. The first are tabulated and were as follows :—

Arrangement to show Average Daily Number Eggs Deposited. Adults Emerging and Confined, 3rd February, 1925.

Number.	Hatchings.						Totals.	Average per diem.	Maximum.
	Feb. 16.	Feb. 17.	Feb. 18.	Feb. 19.	Feb. 20.	Feb. 21.			
1	1	1	1	2	4	2	11	1·8	..
2	0	1	2	1	4	3	11	2·2	..
3	0	2	10	Fruit	rotted		12	4·0	10
4	0	5	4	5	4	3	21	4·2	..
Average ..	..	..	..		..	..	..	3·0	10

From this table the approximate number of progeny can be calculated.

The average period of oviposition extends over 37 days, thus it is apparent that there will not be distinct generations of the insect. By presupposing distinct generations, however, and postulating a life cycle of 45 days as that which will allow most nearly for the approximation, the total number of descendants possible from one fertile female may be calculated.

The average oviposition is at the rate of 3 eggs per day so that the approximate number of eggs laid in the life of one female is 111, and of these approximately two-thirds are female (*see* proportion of sexes). For one year the number of hypothetical generations, each taking 45 days, would be 8. The progeny of each generation then would be as follows :—

1st generation	111
2nd generation	8,214
3rd generation	607,836
4th generation	45,046,464
5th generation	3,333,438,336
6th generation	246,674,436,864
7th generation	18,253,908,327,936
8th generation	1,350,789,216,267,264
Total	1,369,293,178,133,025

In regard to oviposition, the following observations will aid (to show daily rate of egg-laying, continuity of same and so forth). The observations were made toward the end of the period and are comparable with those made from the very start of the period, when the female was vigorous.

Date Confined.	No. 1, Dec. 12.	No. 2, Dec. 6.	No. 3, Dec. 11.	No. 4, Oct. 14.	No. 5, Dec. 3.	No. 6, Dec. 3.	No. 7, Dec. 11.	No. 8, Dec. 12.
Date 1st Descendants ..	—	Dec. 19.	Dec. 26.	Oct. 30.	Dec. 18.	Dec. 18.	Dec. 31.	Dec. 29.
Day No. 1	3	3	4	3	3	2	6	6
Day No. 2	7	3	2	3	2	1	5	1
Day No. 3	5	2	0	3	2	1	4	2
Day No. 4	6	3	1	3	4	1	4	4
Day No. 5	3	2	1	3	2	2	2	4
Day No. 6	3	3	2	..	2	3	3	4
Day No. 7	1	1	..	..	2	2	0	2
Day No. 8	2	2	..	..	1	3	1	2
Day No. 9	..	2	..	..	2	4	2	3
Day No. 10	..	1	..	..	2	5	3	0
Day No. 11	..	3	..	..	2	2	..	1
Day No. 12	..	3	..	..	3	3	..	2
Day No. 13	..	4	..	..	2	1	..	2
Day No. 14	..	3	..	..	2	..	..	2
Day No. 15	..	3	..	..	2	..	..	1
Day No. 16	..	3	..	..	2	..	..	1
Day No. 17	..	1	..	..	2	..	..	0
Day No. 18	..	1	..	..	1	..	..	1
Day No. 19	..	2	..	..	1	..	..	..
Day No. 20	..	1	..	..	1	..	..	..
Average per day	3·7	2·3	1 6	3	2·0	2·3	2·8	2·1
General average	..	..	..	..	..	..	..	2·4

It may be seen from the above tables that oviposition is almost continuous over a rather long period, and, seemingly, the rate per day is small, declining as the female ages. But, after oviposition commences, rarely does the female rest even for a day.

Number of Young per Fruit.

A rather large number of fruits were kept under observation from 14th October, 1924, to about the middle of February 1925. The hatchings from these were carefully counted, resulting as follows :—

Table showing the Average Number of Larvæ Hatching from One Fruit.

Number of Lots.	Number of Fruits.	Total Number Hatching.	Average per Fruit.	Dates.
38	186	1,221	6·5	Oct.-Feb.

This gives some notion of the number of insects hatching from any particular fruit but does not represent the entire number which may have hatched, since further oviposition could have taken place in most instances. To show how the number increases as the summer advances the hatchings are arranged by the month.

Table showing Average Number of Larvæ from One Fruit and Increase Seasonally.

	October.			November.			December.			January.			February.		
No. Fruits.	Total Young	Average.		No. Fruits.	Total Young	Average.	No. Fruits	Total Young	Average.	No. Fruits	Total Young	Average.	No. Fruits	Total Young	Average.
38	43	1·1		29	39	1·3	58	139	2·4	50	334	6·6	14	230	16·4

Thus, there is a gradual increase. The small number of fruits for February probably somewhat unbalances the ratio, more especially since the fruits were more or less selected for infestation.

Hatching from Submature, Drying and Aborts.

Larvæ have been hatched frequently from submature and even ripe fruits and shrivelling of the fruit does not kill the eggs. Decay, however, does. Larvæ have also been hatched from the aborts or minute "tip fruits" and in numbers. Thus from 31st December-16th January, from 19 of them, 41 larvæ hatched; 13th-27th January, from 11, 75 hatched; and 8th-19th January, from 9 aborts, 16 larvæ. These aborts are usually infested and even the ovary is often "silvered."

Number of Young relative to Young and Old Fruit.

For the most part, the fruits for this purpose were selected for infestation, but the two lots are equal in respect to this as the selection was quite random. The following scheme shows that infestation is greater with the younger fruit. The latter includes all normal fruit up to two-thirds grown; by "old fruit" is meant all over two-thirds grown up to that which is ready to be harvested and is practically mature.

Scheme to show Abundance relative to Age of Fruit.

Young Fruit.			Old Fruit,		
Number of Fruits.	Total Young.	Average.	Number of Fruits.	Total Young.	Average.
41	291	7·0	108	32	3·3
Winter, collection ..	64	..	..	38 (Adults, larvæ.)	

DISTRIBUTION OF THRIPS UPON THE BUNCHES.

Observation soon showed that as far as the fruit was concerned it was that first opened, the oldest or the basal, which was invariably the first and usually the most infested. To show this clearly the following observations were made on 13th February, 1925, thus tabulated :—

DISTRIBUTION UPON THE BUNCH, CAVENDISH.

——	Basal Hand.	Middle Hand.	Tips or Aborts.	Total.
Number of thrips	302	130	66	498
Percentage	61	26	13	100

Sixteen bunches of all ages were taken at random ; in each site (basal, middle, and tip), three infested "rings" or sides were taken each count. The number per bunch is 31·1, which is much lower than what the entire bunch would bear, and the number per colony is 3·4 average.

DISTRIBUTION WITHIN THE COLONIES.

The number of individuals within a colony varies considerably, usually from several larvæ to 40-50 larvæ and adults, the larvæ nearly always much in excess ; but on very young fruit the adults are occasionally numerous and much in excess (*see* later). Occasionally the number may be more. The largest colonies ever seen contained 115 and 171, all larvæ and crowded upon two sides of single young fruits. The reason that, despite the obvious increase in numbers, the colonies do not increase greatly in size is believed to be due to the fact that these insects do not like contact and as soon as crowding commences some of them move away to other sites. In confinement, the descendants from about 40 adults on one fruit soon became so numerous that the adults literally appeared to be harassed to death ; for having no escape and being constantly kept on the alert they soon died (much before their natural span and from no other apparent reason).

The following data were obtained from forty colonies upon the fruit, 13th February, 1925. The counts were made quite at random from every part of the bunch and from young and old fruits :—

NUMBER OF INDIVIDUALS PER COLONY. LATE SUMMER.

Number of Colonies.	Number of Young etc. Total.	Maximum.	Minimum.	Average.			Number of Adults in whole.
				Larvæ.	Adults.	Both.	
40	337	60	1	7·8	0·6	8·4	24

Variation :—33, 4, 1, 2, 2, 2, 7, 2, 4, 1, 4, 1, 1, 4, 2, 5, 2, 6, 3, 3, 2, 11, 5, 14, 2, 5, 13, 1, 7, 4, 18, 7, 1, 2, 2, 53, 27, 60, 9, 5.

The incidence of adults was thus, e.g., 33 (1) ; 4 (1) ; 1 (0) ; 2 (1) ; 2 (0) ; 7 (0) ; 2 (0) ; 4 (1) ; 53 (0) ; 60 (0) ; 9 (1) ; 5 (0), &c. In winter the average number per fruit colony was 3.

In July 1924, Mr. Simmonds and the writer found that of 1,531 specimens observed upon the fruit 73 per cent. were larvæ, the rest adults. And of 2,185 specimens noted from the entire plant, 1,309 or 59 per cent. were larvæ.

RELATIVE NUMBERS OF THE THREE SPECIES.

The data in the table just given were also utilised to gain a notion of the relative abundance of the species *bilongilineatus* and the black species, both in reference to *signipennis*. Thus, of the 337 units in these 40 colonies, 4 were of the black species (1 adult, 3 larvæ) and 8 *bilongilineatus*. Thus, the species *bilongilineatus* made up but 2·37 per cent. and the black species but 1·18 per cent. of the whole. This is about the true ratio at which the three species occur upon the banana in the Gympie area. So the one species *signipennis* is responsible for practically all rusting of the fruit.

HISTORY OF A GENERATION.

Two males and one female were taken from banana plants on 29th October, 1924, and confined with food. The males died on 17th and 21st November respectively. The female evidently began laying eggs soon after capture, for the first of her progeny since confinement hatched on 17th November, and mature larvæ were noted a week later (24th November). The fruit bearing the female and her young was then transferred over soil. On 26th November there were many larvæ of all stages, and on 27th November larvæ were noticed entering the soil. On 28th November, 34 young were counted upon the fruit.

On 2nd December the parent was slowly crawling about, apparently laying eggs, the sheath-like ovipositor out and down, its tip dragged along the surface of the fruit. On 4th December the parent died. On the 11th 4 adults emerged from the soil and one was in the soil near the surface (on the 6th, a black adult had emerged). On 12th December, 2 more adults emerged and another was in the soil against sides of the glass tube. Old and recent young still on the fruit, latter very mouldy. On 3rd December, 2 males emerged and on the 15th, 2 more. Emergences then followed :—

December	16	.. ..	7
,,	17	.. ..	1
,,	19	.. ..	7
,,	22	.. ..	6
,,	26	.. ..	9
,,	29	.. ..	3
,,	31	.. ..	2
January	3	.. ..	6
,,	6	.. ..	a pair
,,	7	.. ..	9 adults.

The period of emergence of adults ought to be about equal to the period of oviposition. The latter was from 29th October to 4th December, or 36 days ; emergence occurred between 11th December and 9th January, or 29 days.

GENERAL DESCRIPTION.

Adults.—The species *signipennis* is yellow in colour with two black wing-scales, these in conjunction with the black base of the wings forming two roundish black spots about the apex of the thorax (somewhat before middle of body). This golden colour and the two spots are characteristic. The antennæ are dusky toward apex and the fore wings are black with two clear areas, a longer one near base and the other at apex. The species *bilongilineatus* is of a more greenish yellow, has wholly black forewings, dark antennæ, and black lateral margins of the pronotum. The adults of both species are visible to the naked eye but magnification is necessary for recognition.

When just transformed, the wings and wing-scales are white, fringes dark, ovipositor pale, general colour paler, other colours usual. This refers to *signipennis*.

Secondary Sexual Differences.

The male is smaller and in the female the wings usually do not attain to the apex of the abdomen. The male bears a characteristic which makes identification tolerably easy. This is a short erect jet-black tooth above on the abdomen near apex. On the venter both sexes bear a dark-red median line from apex abdomen ; this is twice longer in the female and is, with it, the ovipositor. The apex of the abdomen in the female comes to a point like the apex of a wedge ; it is somewhat more obtuse in the male.

SEASONAL INCREASE.

No data were collected to show this, but in general the insect increases very imperceptibly. Thus in the last week of September 1924 it was noted that, since last July, there had been no change in the apparent numbers of the insect. And no migration, a symptom of overcrowding, was noted until the last several days of November. At this time and during December an increase of the insect was obvious, and through January and February the colonies were undeniably more abundant throughout the infested plantations. These observations refer solely to one site and three plantations. The species remained scarce elsewhere (as far as known), or at least in those plantations of the same area.

OCCURRENCE IN REFERENCE TO THE SUN.

No distribution on the pseudostem in reference to direct sunlight was observed. On 27th October, 1924, special notice of this was taken when banana plants along a roadside were examined. The stems of these were exposed to the full morning sun for at least four to five hours, but under the sheaths so exposed full colonies of young adults were found. These were normal and under the direct rays.

Later observations were made upon isolated stools. These were always fully exposed to the sun (whereas in a plantation the stems of the plants are much in the shade) and had no large leaves as yet. They were examined from time to time and the colonies were quite normally distributed. Nor did the insects fail to increase upon these plants as the summer advanced. When migrating, the young have been observed in direct sunlight.

INCREASE UPON THE FRUIT.

It was thought that, if a colony occurred in October upon a bunch of fruit that was young, two months later it (the fruit) ought to be full of the insects but such is not the case. For example, on 13th October, 1924, a bunch of young fruit was marked for observation. The fruit was black-tipped, about 5 inches long, angular, bearing "rust" in the "powdery" form (irregular rings or lines near base), and scattered young in both stages. The rust was mostly upon the basal hands, occasionally present on the apical fruit. The thrips were rare, several here and there ; they were also scarce upon the stem (pseudostem) of the plant bearing this bunch. By 5th November there was no change, the fruit half-grown. On 1st December, or after seven weeks, the fruit was submature and practically clean, but the "powdery" rings or chains of rust were rather more extensive. There were only a few thrips here and there. Where an extensive change was expected, none occurred.

On the same date a second bunch was marked and for the same purpose. This was very similar to the first but also bore a few adults. No change could be noticed on 29th October and on 1st December ; like the first, it was submature and practically as it. (For additional data, *see* Sulphur, Field Experiments, No. 1, 4th December, and the details of the field experiments with pyrethrum).

DISTRIBUTION UPON VERY YOUNG AND OLDER FRUIT.

These few data were gathered from Cavendish bananas. The two groups comprised young fruits whose tips had not yet darkened and those older whose tips had darkened. The incidence of adults is marked. The table shows this :—

Number Counted.	White Tips.	Old, Dark Tips.
100 fruits (Dec. 1924) ..	20 (all adults)	69 (mostly larvæ)
? Winter*	71 (all adult except one)	124 (28 adults only)

* Counted by J. H. Simmonds.

In the white-tips, the adults are more abundant than the young, for the reason that it is at this stage that the fruit is attacked (or as soon as it is loosed by the bract—the insect cannot enter beneath the bract when the latter is closed)* and young have not had time to hatch. However, they do occur upon the fruit at this stage. Adults and the powdery form of the rust have been observed upon fruit with not more than the first six hands open, all yet beneath the bracts where the thrips like to shelter. They have been observed when only the first bract was loose (May).

DISTRIBUTION UPON SUGAR BANANAS IN REFERENCE TO AGE.

Sugar bananas do not become infested with thrips, as far as I could ascertain, until the fruit are about one-third grown. This gives this variety a great advantage over Cavendish, which is attacked as soon as the fruit is accessible. The reason for this immunity lies in the fact that the thrips do not like light and, as the fruits of the sugar bananas are well spread when they are young, no concealed or dark places are present for them to hide in. The fruits diverge shortly after they are disclosed.

Most of the fruit of this tall-growing banana was out of my reach, but the writer was unable ever to detect even the first traces of rust upon them before they have closed up, nor has he ever found a thrips upon them at this stage of their development. However, the older, closely applied fruit was almost invariably infested. Examination of this variety for this purpose was made when thrips were abundant, that is, 10th February, 1925.

Mr. Robert Long, who grows more sugar bananas than Cavendish, also concluded as above, and he had taken particular pains to make inquiries.

MANNER OF INFESTATION OF THE BUNCH.

Some experimental work in reference to this had been planned but was overlooked. Whether the adults fly to the fruit or crawl to it is not known, but from the data given elsewhere, showing that it is the basal hand (or hands) which is invariably the one infested (if there is infestation), it is likely that they crawl from the pseudostem, down the stem of the bunch and so on to the first hand of it. The same argument may be used in favour of flight of the adults to the bunch.

EXPOSURE TO HEAT OF SOIL FATAL.

At 2 o'clock p.m., 29th December, 1924, in succession, there were placed larvæ (just taken from a plant near-by) onto the bare soil in the direct sunlight. They immediately died and were shrivelled after five minutes. No movement took place after the insects touched the soil though

* But as already stated, from the first hand they can, and do, penetrate to the interior whether the remaining bracts are loose or not.—A.A.G.

they were struggling just previous to that instant. The soil surface was so hot that the hand could barely be left in contact with it. The stems of the plants (isolated stools) from which the insects were taken were warm, nearly hot.

A slice of infested stem was then taken, bearing 20 larvæ of all ages and 3 adults; this was placed outside up upon the soil. All but 9 young had reached the under (shaded) side after 7 minutes. One fell off onto the soil and died. The 9 above were then pushed off onto the soil, one after the other, and, as they touched, each died instantly. The remainder, now upon the lower side, were treated the same way and each died as it touched the soil. Not one attempted to leave the piece of plant.

As a marked contrast to this fatal effect of the heated soil, large and small mites and numerous small ants were crawling over the earth at this spot, engaged, and in a portion of their natural habitat.

This effect of the heat of the sun has some bearing upon control. It insures death to all thrips dislodged from the fruit at least during the heat of the day in summer, and possibly many of the pupæ could be exposed to it by means of cultivation.

DISTRIBUTION IN REFERENCE TO MATURE AND YOUNG PLANTS.

The following data were gathered early in July 1924 by Mr. J. H. Simmonds and the writer:—

——	Number.	Number of Insects.	Average.
Stools or young plants	13	349	27
Mature plants—			
Bearing	8 } 12	374 }	47 } 31
Not bearing	4 }	60 }	15 }

The insects were at that time most abundant upon mature plants with bunches of fruit and least abundant with non-bearing mature fruits. On the former they varied from 0 to 151, and upon stools from 0 to 102.

THE SAME IN REFERENCE TO PARTICULAR PLANT PARTS.

The data is tabulated. The plants were, of course, bearing:—

Part.	Number of Plants.	Number of Insects.
Stem	16	176
Fruit	16	979

FLIGHT.

Flight has never been observed though very likely it takes place. The following observations were made in reference to it:—

(1) On 22nd September a male was captured and placed upon the hand. It crawled about amongst the hairs of the skin for twenty minutes without making the slightest attempt to leap or fly, even if urged. A second adult at once leapt 4 inches and was lost. A third, a male, crawled about for ten minutes.

(2) Later, four adults of mixed sexes were taken upon the tip of the finger. They merely crawled about making no attempt either to leap or to fly. All in the morning.

(3) In three or four instances, separate adults were taken onto the finger-tips and in no case did they attempt to leap or fly. This at 4 p.m.

(4) On 14th October, while capturing adults by means of a camel's-hair brush, several were observed to leap several inches. Later, adults confined in a vial were seen, on exposure to light, to extend their wings and hop from one side to the other.

(5) When adults, confined within small vials, were removed from them onto white paper, they frequently erected their wings and "hopped" a short distance.

(6) A male upon the pseudostem was uncovered at 11 a.m., 22nd October, and watched. It crawled about for ten minutes, making no attempt to fly. A second male did the same thing. This is their usual habit, and no actual flying has ever been observed.

ENEMIES.

The only one so far observed was a red mite seen occasionally fastened to both adults and young. Its relation to the thrips is unknown.

PART II.—REMEDIAL.

PRELIMINARY EXPERIMENTS.

When this species recently attracted attention, application was made to the Fijian authorities for remedies; it was at first thought to occur in that country. From thence, the application of dry pyrethrum powder was recommended, and the first experiments had to do with that, tobacco dust, and sulphur. Other likely sprays were subsequently tested.

TOBACCO ELIMINATED.

On 24th September one young larva was dusted (using a hand blower) with tobacco dust. The insect remained inert for twenty minutes, the powder adhering to it and apparently having no effect. Then an adult female on stem under a leaf was similarly treated. It continued to crawl about as if the powder had had no effect. Then another larva was treated; it acted as did the first one.

Then a nearly grown larva was powdered thoroughly. It crawled slowly about as formerly and through and through the dusted area. After three minutes, the treatment was repeated. It continued as before for fifteen minutes and apparently without anything unnatural about it. A control acted similarly. Tobacco dust apparently has no effect upon either young or adult. The experiment was repeated a week later with similar results. (*See* later, under Snailend.)

PYRETHRUM EFFECTIVE.

The following experiments were performed as a preliminary test of this insecticide (25th September, 1924) :—

(1) Pseudostem of old plant—pulled sheath down and counted 3 adults, 6 young which were dusted at once and the sheath put back. 25th September, 4 p.m.

On 26th September, 7 a.m., upon examination, found 2 apparently dead adults in the moist bottom of the sheath, no others present.

(2) Adjoining sucker, similar process, 3 adults, 14 various young. Same hour as before 26th September, nothing was found under the sheath.

(3) When adults on a pseudostem were powdered, the powder adhered to them and after running for a minute or so they dropped off onto the ground.

(4) Powdered 2 young, 2 adults on pseudostems. All had dropped off on to the ground after two minutes, though they attempted to keep hold of the plant. They seemed to lose control of their legs.

(5) The same with 3 adults, 4 young of various sizes.

(6) The same with 3 larvæ.

(7) The same with 2 adults, 1 young.

(8) The same with 1 adult, 3 young.

(9) The same with 10 adults, 2 young.

These experiments proved that pyrethrum powder was almost instantly effective in clearing the plant of the thrips.

It was here used mixed with finest wood ashes, 50 parts of each.

It now remained to find if the powder was fatal to the insects and at what strengths. The first experiments toward this end were undertaken on 21st October. A nearly grown larva was removed from a sucker and placed onto a piece of white paper. With a camel's-hair brush dipped into fresh powder of the same strength (50 per cent.), the insect was lightly daubed. It continued crawling, but soon showed visible disturbances. After a minute it was upon its back and after forty minutes it was still kicking upon its back and had been unable to regain its feet. Died.

A male was similarly treated. It was upon its back after two minutes. The powder seems to act even though but a particle or two adheres to the insect. This adult continued struggling to regain power of locomotion, but after three-quarters of an hour this ceased. At an hour and a-quarter the wind blew it upon its feet, upon which it became agitated but was unable to move. By half-past 11, or after two hours and a-quarter, it was to all appearances dead. It had not moved a quarter of an inch after convulsions began. Did not recover.

With a grown larva the experiment was repeated. The larva was upon its back by 10·18 a.m. or after two minutes, having crawled but several millimetres. Later, it regained its feet and remained with its legs in constant agitation but unable to progress in any direction. Still struggling at noon and had moved an inch and a-half. An hour later it was inert upon its back. Died.

At 2 p.m., 21st October, 3 larvæ of the two stages were similarly treated. Upon treatment, two of the larvæ crawled 2 and 3 inches respectively before toppling over. At 4 p.m. these two were still upon their backs, hard struggling. At 3·45 p.m. the third had slowly regained its feet and began to move about slowly. However, by 4 p.m. it had another paralytic stroke. All were dead, shrivelled, a.m. 22nd October.

At 4 p.m. another II. was treated. It ceased movement at once and was still inert (though kicking slowly) at 6 p.m., and was dead by the following morning.

Thus it appears to be abundantly proved that this powder, at the above strength, causes death.

At 11 a.m. 24th October a female was touched with the brush dipped into this powder. It continued to crawl rapidly, but after two minutes came to a halt as if walking upon a sticky surface. Then for six minutes it continued spasmodic movements of the legs, finally landing upon its back. After twenty-three minutes it was still upon its back. By noon, although lifted onto its food at intervals (whereupon it managed to crawl feebly its own length), it was practically paralysed. By 2 p.m. dead and shrivelled. Pyrethrum seems to be a specific poison for this insect, paralysing

the nerves. The insect can stand a long while in convulsions but cannot, as a rule, move forward or backward.

On 10th November, a slightly infested bunch of fruit was treated with the powder, usual formula, and a coat was placed upon the ground under it. After several minutes had elapsed, small beetles and minute Hymenoptera, a large psocid, 3 adult thrips, and 1 grown nymph fell upon the coat. The thrips were more active than usual, the adults opening their wings and hopping an inch or two, but this movement was very erratic. The young was in convulsions.

It now remained to find the required strength at which this insecticide must be used in order to be effectively fatal. To that end the following experiments were proposed and performed :—

The Effective Strengths of Various Adulterations of Pyrethrum. Adulterant, Wood Ashes.

Lot No.	Strength.	Number Insects Treated.	Per Cent. Killed.	Average.	Remarks.
	%				
1	33 (1 in 3) ..	2 ♂, 1 ♀ ..	100	..	..
2	33 ..	1 larva, 3 ♀'s	100	..	Powder mixed 4 days before
3	33 ..	2 larvæ, 2 ♂'s, 1 ♀	60	86	1 ♂ ♀ survived and mated
4	25 (1 to 4) ..	4 larvæ ..	100	..	All paralysed after 2 minutes.
5	25 ..	3 larvæ ..	100		
6	25 ..	1 ♂, 1 ♀ ..	100	100	Both died after severe convulsions.
7	25 ..	1 ♂, 2 ♀'s, 3 larvæ	100		
8	25 ..	2 ♂, 2 ♀ ..	75	..	1 ♂ recovered.
9	16·6 (1 to 6) ..	3 larvæ, 1 ♂ ♀	100	..	1 of the larvæ walked considerably.
10	16·6 ..	1 ♂, 2 ♀'s ..	33	66	
11	12·5 (1 to 8) ..	1 ♂, 2 ♀'s ..	66	66	
12	10 (1 to 10) ..	3 ♂ ♀ (3) ..	0	..	All crawled away and escaped.
13	10	1 larva, 2 adults	0	..	Had convulsions but recovered.
14	10	1 larva, 3 adults	0	..	ditto
15	10	2 larvæ ..	100	25	Died after 4 hours.

There is an obvious decrease and variation in effectiveness as the adulteration is increased. It is safe to recommend the powder at 50 per cent. strength, but good results will be obtained at half that strength—that is, at 25 per cent.—and this adulteration should be used in case the treatments have to be increased. The insecticide is more fatal to the adult. (For further note, *see* (2) under Snailend.)

The Amount of Pyrethrum per Bunch.

By actual trial it was found that when adulterated with wood-ashes to half, with a hand-bulb blower, 1 lb. of the powder pyrethrum would treat 230 bunches. Reckoning the cost of the powder at 5s. per lb. (it ought to be cheaper), the cost of materials would be a farthing a bunch. This is reasonable enough providing the treatments do not have to be repeated too many times. During the trial, the treatment of each bunch was thorough, as is necessary. If the treatments have to exceed four, it would be well to adulterate to 25 per cent. of the powder and increase the thoroughness of treatment.

PYRETHRUM EXTRACT.

This is merely the powder of pyrethrum put into water and allowed to seep for an hour or two. The following experiments were performed in order to find the strength necessary for it to become effective against this species of thrips. The powder was at first thoroughly stirred into the water and then left for about half-an-hour. This made a brown fluid, which if allowed to stand longer would gradually clear, as the powder is merely in suspension and slowly settles. The essence of the powder, however, is soluble in water. The following table summarises :—

VARIOUS STRENGTHS OF PYRETHRUM EXTRACT.

Lot No:	Dilution per Quart.	Number of Insects.	Per Cent. Killed.	Remarks.
1	28·5 grs. (·066 oz. avoir.)	3	66	
2	57 (doubled)	6	50	
3	85 (or trebled) ..	8	25	Standing 24 hours.
4	85	6	30	Standing 40 hours.
5	114	11	100	
6	142	6	100	
7	171 (six times) ..	6	50	
8	228	4	50	
9	228 (eight times) ..	7	14	

The experiments seem to be inconclusive. Perhaps they were not carried far enough but it seems that the stronger the infusion was made the less effective it became. Very likely it was not strong enough. However, even so, this infusion is as effective as many of the insecticides used, as shown later. The unit of 28·5 grains apothecary's is equivalent to ·066 of an ounce avoirdupois. Therefore in Lot No. 1 the powder was used at the rate of 0·26 oz. per gallon of water ; in Lot Nos. 8-9, at the rate of 2 oz. per gallon or 1 lb. to 8 gallons. At this rate, at 5s. per lb., a gallon of the extract would cost about 7d.

SULPHUR A DETERRENT.

(1) On 24th October, 1924, flowers of sulphur purchased from a chemist in Gympie was made the object of experiment. As with pyrethrum, wood-ashes were used as an adulterant, using half of each. When an adult was treated, it crawled about for several minutes unharmed, and continuing this was soon lost to view, escaping. A grown nymph was then daubed with it, using a camel's-hair brush. It crawled away unhurt and was kept in view for five minutes, when it was re-treated. This neither had any effect. This larva would not crawl through a field of the substance, but if ordinary flour was placed in its way it would not avoid that but crawled through it (not, however, without mechanical difficulties). After twenty minutes it crawled away and was lost.

(2) On the same date a grown healthy larva was daubed with the brush, the latter bearing the same substance at the same strength. The insect struggled through the powder in three minutes and crawled off at its normal gait, the powder adhering to it. It refused to enter a fresh field, turning aside upon approach and crawling around instead of through it. The larva lost to view after thirteen minutes and during that time had shown no adverse symptoms. It was afterwards found and confined with food, and was in good health twenty-four hours after the experiment.

(3) The same experiment was repeated with an adult female. It hopped vigorously out of the powder, crawled away, refused to enter a fresh field placed in front of it, and was then lost. Fine particles of the powder were adhering to it as with pyrethrum.

Subsequently one field experiment was performed with this substance; *see* later. The sulphur has no direct deleterious effects upon the thrips but they avoid it.

THE EFFECTS OF PYRETHRUM AND SULPHUR UPON HATCHING.

The following experiment was performed to see if, when the fruit had been treated with either pyrethrum or sulphur, these latter would have any effect upon the thrips other than merely killing or driving away the active forms then present upon the fruit. Would either of them have a more prolonged action, killing or preventing the next several days' hatchings ?

At 8 a.m., 11th February, 1925, fifteen recently picked and apparently infested bananas were divided at random into three lots : No. 1, control ; No. 2 treated with sulphur (half wood-ashes) ; No. 3, treated with pyrethrum half, wood-ashes half. The treatments were made with a rubber blower the same as that used in the field, and the treated lots were given a good coating of the two insecticides. All of the lots were then laid side by side upon separate pieces of white paper. They were in the open air.

The following results were shown by records kept :—

EFFECT OF PYRETHRUM AND SULPHUR UPON HATCHING.

Lot.	HATCHINGS, FEBRUARY 1925.					Totals.
	11th, Noon.	12th, 2 p.m.	13th, p.m.	14th, p.m.	15th, *11 a.m.	
Control, 1 ..	1	8	3	5	(6)	17
Sulphur, 2 ..	2	2	0	0	(1)	4
Pyrethrum, 3	0	0	0	0	(4)	0

* Fruits were washed after counting hatch of 14th and hatching at once recommenced.

Thus pyrethrum prevented hatching and sulphur prevented most of it. After washing the fruits, recent larvæ were found upon both treated lots the following morning (15th), but sulphur was still present in places on Lot No. 2. The lots were re-treated 7 a.m., 12th February, but not on the 13th and 14th. Thus, the pyrethrum was effective from 8 a.m. 11th to 7 a.m. 12th, or 24 hours ; and from 7 a.m. 12th to p.m. 14th, practically forty-eight hours. This experiment shows that, providing there is no rain, treatment with these insecticides will keep the fruit clean for several days, besides killing the hatchings over several days.

As regards the sulphur it may be possible that new hatchings occurred and the larvæ left the fruit as soon as hatched, but this is not likely.

On 6th October, 1924, a slice from a badly infested stem was powdered with 50 per cent. pyrethrum. No emergences occurred up to 21st November, although from a control nineteen larvæ hatched. This experiment was repeated but no larvæ hatched from either lot.

With the extract of pyrethrum these experiments with fruit were performed :—

RESULT OF LABORATORY TREATMENT OF INFESTED BANANAS. PYRETHRUM EXTRACT.

Strength.	Number of Fruits.	Treatment.	Hatchings.
57 grains (0·13 oz.)	4	Dipped ..	10
Control	4	None ...	8
114 grains (0·26 oz.)	3	Soaked 1 hour	1
Control	3	None ..	5

These results are not very conclusive. The amount of pyrethrum used in each case was to the quart of water as 0·52 oz. and 1·04 oz. per gallon.

EXPERIMENTS WITH SNAILEND.

This is a preparation obviously composed of tobacco dust and manufactured by W. D. and H. O. Wills (Australasia), Ltd., Sydney. The few experiments performed with it will be given in connection with the above. It is a rather coarse, strong-smelling powder.

(1) Two females emerging 22nd December, 1924, were treated 30th December at half-strength, the adulterant being wood-ashes. The insects were then confined with food and showed no symptoms of having been affected. They lived until 12th January and 13th February respectively. The first one died because the food dried up.

(2) Two adults were treated successively on the same day. No effect was produced. In this experiment, the powder was used unadulterated. As a control, a third adult was treated with the 50 per cent. pyrethrum, and it had the characteristic convulsions though this powder had been mixed a month previously and was standing exposed to the air (it had lost nearly all odour).

The Snailend was then mixed with its bulk of wood-ashes and a fourth adult was treated. It was thought the added fineness of the powder would make it more effective. However, it had no effect and the specimen was confined with food and kept alive one week, then discarded.

FIELD EXPERIMENTS.

SULPHUR.

At 2 o'clock, 17th October, 1924, on a clear, warm, breezy afternoon, ten bunches of young bananas (dark tips) were selected and marked.

With the hand bulb they were then treated with flowers of sulphur mixed with half its bulk of wood-ashes. The latter was sifted and was very light and fluffy. The fruit was free of rust but showing the usual infestation and "rings" near base.

The lot were examined for the first time on 22nd October, or after 5 days. The powder was still present despite heavy rain. It was lodged just where it was wanted, i.e. where the rust commences, down between the fruits where they touch. No injury and no thrips.

On 4th to 6th November it was raining more or less each day, sometimes heavily.

On 10th November, a second examination was made (after 3 + weeks): Bunch No. 1, adults and young on fruit; No. 2, mature young amidst the powder; No. 3, mature, no insects but "rings," as 9; No. 4, as No. 9; No. 5, adults amongst the powder; No. 6, submature, much powder; No. 7, less powder, no insects; No. 8, uprooted by storm, young on fruit and 1 adult *bilongilineatus*; No. 9, some powder, living insects, no thrips; No. 10, powder gathered about the "rings," adults present.

Thus, a little after 3 weeks the bunches were as badly infested as before treatment. Doubtless this reinfestation took place earlier.

A third and final examination was made on 4th December, as follows:—

No. 1.—Submature, no increase of thrips nor of rust except that the rest of the upper row of the basal hand now bear "rings" (formerly on 10th November, of these upper bananas, the most basal, only 1 and 2 from the left bore rings and thrips; now all bear them. Also of the lower or next row of four fruits, the fourth or right was free of "rings") and a thrip or two each. Of the lower, no increase but the rings of 1-3 were more leathery; fruit No. 4 bore a small ring.

No. 2.—Submature, clean. Rings now often elongated, thrips present.

No. 3.—Mature. Powder present. Clean. Rings and thrips. Powder down in the rings.

No. 4.—As 3.

No. 5.—Two-thirds grown. As 3 but cleaner, rings more rare. Adults in the powder.

Nos. 6 and 7.—Harvested.

No. 8.—Rotted away. Had been uprooted as noted before.

No. 9.—Powder still present. Rings fairly common, thrips present. Fruit two-thirds grown.

No. 10.—Fruit submature. Rings and a few thrips.

These ten bunches were compared with ten bunches of similar age selected at random, and there were no differences. The insects were not abundant enough to cause rusting and the experiment was therefore inconclusive. The treatment did no injury and temporarily cleaned the bunches, but did not prevent such slight increase of the rust as did occur.

Field Experiments with Pyrethrum.

All the experiments in the field with this insecticide were made at half-and-half strength. The experiments are herewith given at length. Before each treatment the powder was tested upon insects on the pseudostem and only fresh powder was used.

(1) 24*th September*, 1924.

At 4·30 p.m. to-day, with the blower, six half-grown bunches of bananas were powdered; dry, clear and warm, more or less windy. The treated plants were then plotted for identification. A shower of rain fell 12 hours later but did not remove the powder, which, of course, had had ample time to be effective.

After 22 hours an examination of the bunches was made as follows :—

No. 1.—No living insects	Control : No thrips, a few psocids living.
No. 2.—Much rust at base of bunch. No living insects	Control : 4 young and mites and psocids, all alive.
No. 3.—3 dead psocids	Control : 1 living mite.
No. 4.—1 living mite only	Control : 3 living mites.
No. 5.—Nothing	Control : 2 young and 3 psocids, alive.
No. 6.—Nothing	Control : 2 young and 3 psocids, alive.

Thus the fruit was practically clean. On the treated bunches, only one living mite was found, whereas on similar random bunches selected as controls, 8 living thrips, 11 psocids, and about 7 mites. Although insects were rare, the result is striking enough.

A second examination was made upon 13th October, or after 3 weeks :—

No. 1.—Young and adults but scanty. Rust just apparent.

No. 2.—No thrips. Rust well advanced upon bottom hand.

No. 3.—Broken. No thrips. Traces of powder and rust.

No. 4.—Few young. Rust evident on side, basal fruit.

No. 5.—Powder evident. No insects nor rust.

No. 6, the same as No. 5.

Controls examined were about the same.

A third examination was made on 5th November, or after about 6 weeks :—

No. 1.—Mature. Fruit clean of thrips but the ring-like powdery patches have since become square inches of typical leathery cracked rust. Lower fruit clean of all.

No. 2.—Blown down by storm and fruit removed (about 29th October).

No. 3.—Rust present where ring-like spaces had been. A few basal fruit ripe. Occasional young thrips. Mature.

No. 4.—No thrips. Rust upon the basal fruits where the rings were. Nearly mature.

No. 5.—Two-thirds mature, powder still showing, clean.

No. 6, the same as No. 5.

The controls were about the same. This experiment was inconclusive because the infestation of the fruit was not heavy enough to make a contrast between the treated lot and the control.

The final examination was made on 1st December, 1924 :—

Bunches Nos. 1-4 had been harvested. No. 6 was submature with small leathery patches where the rings had been. A few larvæ present. No. 5 was the same as 6 as to age but a splendid clean bunch ; ring-like form of rust present and a few adults and larvæ. The pseudostems were only slightly infested.

(2) *14th October*, 1924.

Experiment with " White-tips" and " Dark-tips."

Ten bunches of each lot were selected and marked on 14th October, 1924, and then treated. The white-tips or youngest lot will be described first. There was no rust or only the first ring-like form in places.

The first examination was made on 2nd December :—

No. 1.—Half grown, clean. Thrips and rings but moderate.

Nos. 2, 3 as No. 4. No. 4.—Half-grown, nearly clean.

No. 5.—Two-thirds grown. No change.

No. 6.—Half grown, clean but several long powdery patches with young and adults.

No. 7 as No. 5, but rings pronounced and more thrips.

Nos. 8, 9 as No. 4, but on 9 an occasional powdery patch and thrips.

No. 10.—One-third grown but cleaner.

Before this, however, an examination had been made on 5th November. All the fruit was practically clean and unchanged though a few young were present (*see* end of (2)).

The first examination of the dark-tipped young fruit lot was made on 5th November :—

Nos. 1, 2.—Clean, rings present.

Nos. 3, 4.—Clean. Nos. 5-7, Clean.

Nos. 8, 9.—Clean, powder well sifted into the ring patches.

No. 10.—One mature young ; clean, slight rings.

The second examination was made on 2nd December :—

No. 1.—Submature ; clean, no rust nor thrips.

No. 2.—Missing.

No. 3.—Half-grown ; clean but adults and larvæ present, also elongated powdery patches on inner side of basal fruit.

No. 4.—Submature ; clean but ring-form common ; adults and young in small numbers.

Nos. 5-7.—Three-fourths grown ; clean but with rings and adults and young, the latter rather more abundant than usual.

Nos. 8, 9.—Two-thirds grown, clean, ring-form and a few thrips.

No. 10.—Submature, clean.

Thus, here again the insects were not abundant enough for results to show. The controls were about the same. The experiment shows how slowly the insects cause the "disease" and how slowly they increase and that it is useless to treat for them thus early in the season. The final examination was upon 6th January, 1925 :—

Mature, clean, sometimes one angle of fruit rusted to tip, thrips rather abundant in the rings. This refers to both lots. The "white-tips" were submature.

(3) 15*th October*, 1924.

This is another early experiment and there were two treatments. It consisted of ten bunches of young dark-tips with rust showing only in the ring-form and this only upon the basal hands. The treatment to be repeated after 3 weeks. Day clear, warm and with breezes. Time, 10 a.m.-noon.

The first examination was made on 5th November, and the plot was then re-treated. The powder of the first treatment was still showing. There was no change and only an occasional grown larva and one male was seen upon the fruits.

An examination was made on 4th December, 1924 :—

No. 7.—Submature, clean, usual rings, few thrips and rarely a rust area along one angle to apex of fruit.

No. 5.—Three-fourths grown. Occasionally rings very distinct, with adults and young, clean.

No. 1.—Mature ; clean, occasional small patch of rust where ring was and blotched, rings with few thrips.

No. 8.—Submature ; clean, usual rings with adults and young.

No. 2.—Three-fourths grown and as No. 8.

No. 9.—Clean and as 8 but thrips rare. Mature.

No. 10.—Mature and as 8 ; clean.

No. 3.—Submature ; practically clean.

No. 6.—Fruit stunted save basal row ; these two-thirds grown with usual rings.

No. 4.—Two-thirds grown, clean. Usual rings and thrips.

This experiment nearly parallels the second lot of Experiment No. 2. The second treatment made no material difference and did not prevent a slight increase of the rust but the bunches were not disfigured in any way.

The final examination of this experiment was made on 6th January, 1925. For the most part, the bunches were clean, rings very distinct, fruit mature ; sometimes quite a few adults and young were present but not enough to hurt now. One basal fruit bore a large patch of rust toward tip.

(4) *20th November*, 1924.

This experiment is similar to No. 3. The fruit was the same and was but little infested although the usual rings were present. However, two lots were marked out, the one to be treated once and the other twice. This treatment was intended for a rather late one, but as it turned out it was too early and the same inconclusive results were obtained. The first lot—treated twice—was powdered on 20th November ; the other on 24th November. The first, designated A, was examined for the first time on 8th January, 1925. It had been re-treated on 20th December. The fruit was then clean, with rings bearing a few thrips (young and adults).

No. 1.—Submature with rings but scarcely infested.

No. 2.—The same.

No. 3.—Three-fourths grown ; as No. 1 but adults and young present (0-5 to each fruit).

No. 4.—Two-thirds grown ; some elongate powdery patches. Insects not as abundant as in No. 3.

No. 5.—As No. 4 but no elongate patches.

Nos. 6, 7, as No. 1.

No. 8.—Three-fourths grown, clean, rings rare, no thrips.

No. 9.—Nearly as No. 8 but rings more common and a few thrips.

No. 10, about as No. 4.

On the whole, the fruit was about as before treated and as controls. So the treatment merely cleaned the fruit temporarily and the "disease" was not yet increasing. The above was the final examination.

The second lot, or B, was examined for the first and last time on 8th January, 1925, as follows :—

No. 1.—Submature ; a few rings and thrips, clean.

No. 2.—Submature ; thrips rather abundant on basal fruit but latter and whole bunch clean. Splendid full bunch.

No. 3, as No. 2.

Nos. 4, 5.—Two-thirds grown, clean rings and these infested, 0-9 thrips each.

No. 6.—Submature and clean, a few rings and thrips.

No. 7.—Two-thirds grown. A few elongate powdery patches rather badly infested, rest with some rings, mostly clean.

No. 8, as No. 4.

No. 9.—Two-thirds grown ; small bunch infested in some rings. Clean.

No. 10.—Three-fourths grown, clean, rings and a few thrips.

On the whole all as clean as when first treated and not differing from controls.

(5) 13*th January*, 1925.

A late treatment, young dark-tips. To be repeated. Eleven bunches. In No. 6, the bunch was nearly two-thirds grown, many thrips and elongate, wide, rusty patches, not leathery. Five minutes after powdering the fruit was clean. One adult and 1 young were found, the latter bearing powder particles. See if patches of rust, which are cracked in places, turn brown and leathery. The second treatment was given on 6th February, 1925.

On 15th January, examination of a few of the bunches showed recent young and an occasional adult and mature larva (either migrants or escapees).

Nos. 1-4 were treated (6th February) just before a rather heavy shower but the powder had had time (5 minutes) to work. After half-an-hour, treatment of the rest was resumed because they had sufficiently dried (were not dripping, only moist).

Nos. 1-4 were dirty in places with the powdery forms of the rust.

No. 5 had some of the basal fruit a dirty red with rust but only in splotches ; it was worse in the second row from base. Fruit submature.

No. 6.—Now mature, only a few thrips ; the badly rusted patches on basal fruits (latter very large and full) have leathered only in streaks here and there but the purple "powdering" gives them a diseased appearance. Young were present.

No. 7.—Considerably discoloured in places by a purplish splotching, especially basally, but even small tip fruit is dirty. No thrips.

No. 8.—Two-thirds grown ; many of the fruits purplish around the apices and sometimes along one side ; no thrips nor leathering as yet.

No. 9.—Two-thirds grown ; clean but "rings" increasing ; thrips common in places (colonies) but not abundant (in the sense of space, they do not cover the fruit along one side).

No. 10.—Picked.

No. 11.—Submature ; a few "rings" now elongate and a lot of purple end but fruit has a clean appearance.

Untreated adjacent bunches are about the same. The treatment has not prevented "dirtying" of the bunches, but in adjacent controls no leathering is present and but few thrips.

On 9th February the bunches were examined, more especially to obtain further data in reference to the effect of the pyrethrum.

No. 1.—Bunch clean but 1 adult was found and 4 recently hatched young on about eight fruits (this A.M.'s hatch). Also No. 2, six fruits examined bore no thrips, basal hand. Also No. 3, seven infested rings showed but 1 young (this morning's hatch). A control bunch of younger, quarter-grown dark-tips yielded 60 thrips upon four fruits. Thus from twenty-one fruits of the treated lot, only 6 thrips were found and five-sixths of them had just hatched ; moreover, it was raining off and on. In great contrast, from but four random fruits taken from an untreated bunch, 60 thrips were obtained.

No. 4.—In seven rings only 1 thrips, this hatching from a papilla upon the ring ; there was no powder just near it but much around it and this had been rained upon. In contrast, on a control, on seven places upon fruit of equal age, 31 thrips of all stages were found.

No. 6.—Mature bunch, one side of several basal fruits badly blotched with purple, from six places, 2 just-hatched larvæ. As a contrast, six control places yielded 10 of all stages.

No. 7.—No larvæ in six rings.

No. 11.—One recent young in six places ; this young had just hatched. It was watched, the fruit being picked. There was a lot of powder scattered about and the larva soon had some adhering to it. However, no effect followed and the powder had evidently lost its strength (through exposure to rain, etc.). A control of similar age, six places, 4 larvæ (3 mature, 1 new).

This examination showed how effective the treatment had been in cleaning the fruit ; also that hatching was prevented on 7th-8th February, as on the 9th only that day's larvæ were present (it has been proved that the powder actually prevents hatching).

(6) *9th February*, 1925.

A late treatment, to be repeated four times (every ten days) and begun with the youngest fruit. The experiment consisted of four bunches of young "white-tips" infested with adults and occasionally showing elongate patches of powdery rust and with about eleven hands out of the bracts. On bunch 4 considerable larvæ were present, besides the adults. The first examination and second treatment were made on 18th February, 1925. Before the second treatment, the fruit was as follows (after 9 days) :—

Bunch No. 1.—Only a few recent young found here and there. However, on one fruit of basal bunch, with elongate patches on each side, 77 young (+ 1 male), mostly recent, were found ; a few of these larvæ were mature. On the other side of this fruit were 92 (+ 1 female), a total of 171.

Bunch No. 2.—Practically free of thrips.

Bunch No. 3.—One mating pair observed ; very few thrips.

Bunch No. 4.—Very few, if any, thrips.

All bunches still full of the powdering.

This experiment was completed by Mr. B. F. Schmidt of Chatsworth and he reports on 16th April, 1925, that two more of the treatments were given and now very few thrips could be found. The fruit is not mature enough to forecast its final state but are considerably cleaner than untreated bunches. However, he considers several more treatments necessary but with longer intervals between.

ILLUSTRATION OF THE PRACTICAL EFFECT OF PYRETHRUM.

On 9th February, 1925, an infested bunch was selected for the purpose of showing the effective cleaning-power of pyrethrum. At first six infested places were selected for examination (six colonies within their rings), finding 34 thrips. The bunch was then thoroughly powdered, using the bulb-blower, and a coat was placed upon the ground beneath it. The powder had first been tested and found effective. Soon, upon the coat were found a few submature larvæ, inert. The insects were therefore falling from the fruit. An hour later, six rings were examined, finding but 3 submature larvæ. The infestation had been reduced from 34 to 3.

OTHER FIELD EXPERIMENTS.

(1) Bordeaux Mixture.

This well-known fungicide was recommended for trial as a deterrent. Accordingly, on 10th December, 1924, ten bunches for this purpose were marked off, the fruit all young, dark-tips, clean save for occasional rings and a few thrips. More highly infested fruit could not be obtained. The substance was used at the rate of 1 lb. to 30 gallons water.

On 16th December, 1924, the first examination was made. The fruit had the usual appearance of foliage sprayed with this substance and the rings had the bluish deposit all around them. Despite this, occasional young and adult thrips were found within them.

A second examination was made on 8th January or after a month. Fruit now from two-thirds to three-fourths grown and clean, but with infested rings quite as with untreated bananas of this time and of the same age. Sometimes there were elongate, powdery patches. The spray still persists in the well-known spots; no injury was done.

As a control to this not only were genuine controls examined but a laboratory experiment was performed on 15th December. Three adults, 1 male, 2 females, were placed into a drop of the mixture and allowed to crawl out. They were then confined with food. A fourth adult crawled out of the liquor and escaped. They lived until 22nd December, or for a full week after treatment, death being due to accidental causes (food dried up).

(2) Black-leaf 40 (Nicotine Sulphate).

This is now a well-known commercial insecticide. It was used in two field experiments and in a number of laboratory tests. The details of the field experiments are as follows:—

A. Spraying Pseudostem.—On 15th October, 1924, six infested banana plants in bearing were thoroughly sprayed with this liquor at double the recommended strength and with a little soap. The fruits were young, not rusted but with the powdery ring-form. A first examination was made upon 22nd October, or after a week as follows (only the stems had been treated):—

Tree No.	Insects: Treated.	Control.
1	0	2 (psocids)
2	3 (1 thrips)	1 (mite)
3	1 (thrips)	6 (thrips)
4	2 (psocids)	8 (thrips 6)
5	0	0
6	0	0
Totals	6	17

There is a marked difference in infestation between the two lots but the insects were not abundant.

On 10th November a second examination was made :—No. 1, barely infested. Of the fruit (not treated), second hand from base (above) upper row, Nos. 2-11 bear the ring-form of rust. No. 1 (left to right, facing the bunch) has none. Will any of these be rusted on maturity ? No. 1 on the lower line has none but the rest in its line have. Will these be rusted and 1 not ?

(On 4th December, Nos. 1-11 have the ring, elongated in a few. Of lower line, all now bear the ring ; none were rusted at maturity).

No. 2, infested but not badly. No. 3, the same.

No. 4.—Adults common. Practically all basal fruit show ring-form but only a rare thrips.

No. 5.—Adults fairly common. Also on the fruit, with young ; basal bunches showing rings.

No. 6.—Occasional adult. Fruit mostly clean but with occasional young and the rings present on basal fruit, sometimes toward the tip.

On the 4th December following, a final examination was made :—

No. 1.—Both stem and fruit infested but not badly. Fruit submature, with rings.

No. 2.—Both stems and fruit slightly infested.

No. 3.—As No. 1 but fruit younger and only slightly infested.

No. 4.—Stem moderately badly infested. Fruit two-thirds grown, rings and a few thrips.

No. 5.—Submature, an occasional patch of genuine leathery rust at the former rings, thrips not abundant. Stem " badly" infested.

No. 6.—Stem moderately infested. Fruit submature, insects rare but rings present. After the first examination, the controls did not differ materially from the treated lot.

B. Spraying Pseudostem and Fruit.—On the same date as with A, six plants were similarly sprayed, including the fruit. The latter were similar to those in A.

The first examination was not made until 4th December, 1924, as follows :—

No. 1.—Fruit submature, clean but ring-like and elongate powdery rust frequent, larvæ and adults more numerous than usual. Stem rather badly infested (say 40 specimens to a colony, sometimes).

No. 2.—As No. 1 but stem less infested. No. 3, as No. 1 but fruit two-thirds grown, the rust not quite so extensive.

No. 4.—Mature ; stem infested rather badly. Fruit as in No. 1.

No. 5.—Two-thirds grown ; clean. Stem with numerous thrips, fruit as in No. 1 but rust less developed.

No. 6.—As No. 5. Controls were very similar.

The final examination was made on 6th January, 1925. The plants were about as in the first examination but most of the fruit had been harvested, only two bunches remaining. The experiment shows that, despite the treatment, the insects increased about at a normal rate.

Dipping Experiments with Black-leaf 40.

(1) Three infested suckers dipped 27th August in the liquid double recommended strength. After drying they were examined and nothing living found upon them. Same on 20th September.

(2) Six adults, 1 nymph kept immersed for thirty minutes in Bl. 40, usual strength, i.e. recommended strength, 20th September, 4 p.m.

21st September, 7 a.m., 4 adults, 1 young remaining, all dead. Same 22nd September. Remainder escaped.

(3) 20th September, 1924, 11 a.m. Normal or recommended strength :

Lot No.	Insects.	Time.	Result.
		Minutes.	
A ..	2 adults	10	Dead.
B ..	1 young	10	Alive (escaped after ½ hour).
C ..	1 young	5	Alive at 4 p.m.
D ..	10 adults	5	Alive at 4 p.m. 22 Sept., a.m. 70 per cent. dead, or 7.

(4) 24th September, 1924.—Took two 3½-foot suckers showing infestation by observation (and the dark colour of the pseudostem, as then supposed, a symptom of infestation) and at twenty to 9 a.m. submerged them for thirty minutes in the liquor at double strength. After drying, the plants were carefully examined and 8 living adults (kicking but not walking) were found and 1 small young. These were put aside for observation.

On the following day at 8 a.m., 1 young, 6 adults dead ; one of the latter alive and able to crawl but it died on 24th September.

(5) At noon, 21st September, a large number of young and adults were submerged for twenty minutes, same strength as in (4). Seven adults 2 young were obtained for observation. Two of the adults were crawling a bit. All subsequently escaped except one which died.

(6) On 21st September, noon, a small sucker was dipped for twenty minutes in Bl. 40, double strength. The following day, at noon, the sucker was examined, finding 2 young and 7 adults all dead.

(7) Two dozen young dark-tips were dipped into the same solution as in (6), dried and wrapped in paper, 22nd September. Nothing hatched from them up to 26th September.

EXPERIMENTAL DIPPING OF FRUITS.

These experiments were performed in order to see if insecticides would kill the eggs within the fruit. They are tabulated as follows. Each lot was taken at random from a unit lot of fruit. The treated lots were drained off, allowed to dry, and spread in the open air. Some of the treated lots were kept after drying, wrapped in paper.

TABLE SHOWING EFFECT OF DIPPING INTO BLACK-LEAF 40 UPON HATCHING. DOUBLE RECOMMENDED STRENGTH.

Lot No.	Number of Fruits.	Duration of Treatment.	Hatchings.		Difference in favour of Control.	
			Treated.	Control.		
						%
1 ..	4	1 minute	1	8	7	88
2 ..	5	1 minute	0	7	7	100
3 ..	5	45 minutes	6	3	—3	33
4 ..	4	1 hour	0	4	4	100
5 ..	4	1 hour (2 weeks old) ..	6	7	1	54
6 ..	5	1 hour (78 hours old) ..	5	14	9	73
7 ..	5	1 hour	2	9	7	81
8 ..	6	1 hour	6	21	15	78
9 ..	5	1 hour (5 days old) ..	1	4	3	75
10 ..	4	1 hour	0	4	4	100
11 ..	5	2 hours (old solution) ..	1	39	38	97
12 ..	8	1 minute (nicotex 1-1000)..	1	7	6	87
		Total	29	127	104	81

Failing Lot No. 3, there is a decided difference between the treated lots and the controls. Of all the hatchings, 82 per cent. were from the control. If the insecticide is so effective with eggs in the fruit it ought to be equally so upon those within the stem, but actual tests of this were not made except in the case of the tests with infested stools, given above. In these, no hatchings were observed. *See* below, Kerosene Soap.

A few additional experiments of this nature were made with Kerosene Soap and Black-leaf 40, the following formula :—One tenth bar of Campbell's Soap Mixture to each one gallon water and the nicotine added at the recommended strength. All treated lots in open air.

TABLE OF ADDITIONAL DIPPING EXPERIMENTS WITH FRUITS.

Lot No.	Number of Fruits.	Treatment and Duration.	Hatchings.		Difference in favour of Control.
			Treated.	Control.	
					%
1	5	Dipped only	13	9	40
2	4	Dipped (same solution, 48 hours old, reheated)	41	85	67

The smaller quantity of the nicotine seemed to be less effective, but *see* below. This mixture upon standing some hours gelatinised. To re-use, it was but necessary to heat gently.

LABORATORY EXPERIMENTS.

(1) 29th October, 1924, 11 a.m. *Usual or recommended strength.*—Ten young of various ages were dipped into a drop and then removed after they were thoroughly wet. They were at once stupefied. However, after a few minutes, two of the largest crawled off, rest curled up, inert. After twenty minutes, one young crawled off, then another youngest (four minutes later), then two larger ones crawled off (five minutes later) ; rest (four) removed shortly and confined with food in open air. After twenty-four hours three healthy larvæ remained. Thus there was no fatal effect.

(2) At the same time three adults were similarly treated. They seemed to have cramps for a short time, then crawled off. Confined on a banana in cotton-plugged tube. After twenty-four hours one male dead, others alive and normal. This was repeated ; one male lived until drowned 17 days, later ; a second lived until it died three weeks later ; and the third, a female until 1¼ months had elapsed. Per cent. killed for both, 17.

(3) 30th October, 1924. *Double strength plus a little soap.*—One youngest, two grown nymphs dipped into the fluid. All crawled a short distance and then became inert. One crawled off after forty minutes, other two perished. All had convulsions. Sixty-six per cent. killed.

(4) Three young, two adults similarly treated. After an hour, one adult crawled off ; after two hours, one youngest crawled off. Rest died. Sixty per cent. killed.

(5) 31st October, 1924.—Six young were similarly treated. Remained as if dead. Two youngest recovered after an hour and a-half, another after two hours. Rest died. Fifty per cent. killed.

The experiment repeated. One youngest crawled off after an hour, one mature after three hours, and one youngest after three and a-half hours ; a fourth crawled away after five and a-half hours. Thirty-three per cent. killed.

(6) 4th November, 1924. Two males and three larvæ were dipped so as to wet, then removed to surface of white paper. All were at once stupefied. After one hour, one youngest, one mature crawled off. They were tubed with food. The remainder did not move but died where they were.

On the following 48-hour end, one of the two living nymphs was still alive, the other could not be located and very likely died and shrivelled. 12th November, larva mature. The mortality here was 80 per cent.

The effective mortality of the above experiments was as follows :—

1. Usual or recommended strength, 16·5 per cent. or less, average.
2. Double strength, 57 per cent. average.

OTHER LABORATORY EXPERIMENTS.

(1.) *Kerosene Soap (Campbell's Soap Mixture).*—This is a common laundry soap and was prepared for use by taking one-tenth of the usual bar as it comes from the grocer and, after finely dividing it, boiling in a small quantity of water until in solution. The water was then diluted up to a gallon, and, after the solution was cool, the experiments performed.

1. On 2nd January, three adults were wetted in a drop of the fluid ; two had to be assisted out of the fluid after waiting five minutes, the other crawled out. They soon became quite normal and were at once confined with food, dying as follows :—14th January, one male ; 15th January, two females. Non-effective. The experiment was repeated with similar result.

2. Since the above experiment proved so decisively negative it was decided to try the effect of the addition of Black-leaf 40. As the latter is more or less effective according to strength, it was hoped that when combined with a nearly saturated soap solution its strength would be so much greater. The following experiments are tabulated (the strength of the solution was as in No. 1) :—

Lab. No.	Number of Insects.	Remarks.	Per cent. Killed.
1 ..	3 adults	All inert at once. Placed with food ..	66
2 ..	3 adults ..	ditto ditto ..	100
3 ..	2 half-grown larvæ, 3 ♀'s	All inert at once. One ♀ recovered ..	80
4 ..	3 larvæ, 3 adults ..	All inert at once	90
5 ..	2 mature, 2 young larvæ	ditto	100

From these experiments, this insecticide appears to be highly effective. However, owing to a temporary lack of time in which to watch the insects in the open they were all confined and the result may have been due to this. This is unfortunate because nicotine gives off fumes for at least several hours. The above dipping experiments were also jeopardized by using paper wrappers. In both lots of experiments allowance must be made for this. So there is doubt here, unfortunately. The nicotine was used at the usually recommended strength.

(2.) *Nicotex.*—This is an English proprietary insecticide similar to Black-leaf 40, and was used 1-1000 parts water.

1. Dipped a half-grown young. It crawled away and continued crawling for five minutes. It was then re-dipped and after similar actions soon became paralysed and died.

2. Dipped a female. It crawled off but seemed more or less uneasy, as it kept striking the antennæ at intervals with the forelegs. After ten minutes it began to show erratic movements, slowly pacing from side to side. However it regained normal and after some time escaped. Further experiments would likely show this preparation to be as effective as Black-leaf 40, especially with strong soap solution.

(3) *Gympie Solution.*—This was a carbolic solution prepared by a local planter (Mr. Ukran) and given two tests :—

1. Two young, one male were dipped into it. They crawled off and were captured and confined. The male escaped five days later and the larvæ lived until two weeks had elapsed.

2. Two adults dipped. They crawled off, were captured and confined, and lived for five days or until their food dried up.

The solution was wholly ineffective and had the odour of CN (a commercial deodorant).

(4) *Lime-Sulphur Solution.*—Used at the rate of 1 to 8 of water. Two adults and a grown young one were dipped into it. All crawled off at once and were captured and placed upon a banana. As one of the adults and the young escaped from this after forty minutes the remaining adult was tubed. This lived until, by an accident three weeks later, it was killed.

Later, two grown young were dipped ; this treatment had no apparent effect and they escaped before they could be tubed. The same thing happened in reference to another larva. Further experiments were abandoned.

(5) *Miscellaneous.*—The remaining laboratory tests are tabulated. It is unfortunate that more extensive trials of each were not possible under the conditions of the present investigation, but the nature of the insect and the difficulty of keeping those the subject of experiment under control, made this impossible in the limited time.

TABLE OF MISCELLANEOUS LABORATORY EXPERIMENTS.

Lot No.	Insecticide.	Strength.	Number of Insects Used.	Per cent. Killed.	Remarks.
1	Katakilla (powder)	1½ oz.-2 galls. ..	2 larvæ, 2 adults	10	Ineffective
2	Benzole Emulsion ..	1-4 galls. ..	4 larvæ, 3 adults	57	Stupefied at first
3	Ditto ..	ditto ..	3 adults ..	0	Crawled at once
4	Harbas ..	1-25 ..	2 larvæ, 2 adults..	50	Inert at once
5	Ditto ..	ditto ..	1 larva, 1 adult ..	0	Crawled at once
6	Ditto ..	1-40 ..	3 larvæ, 1 male ..	75	Inert at once
7	Ditto ..	ditto ..	4 larvæ, 1 female	40	ditto
8	Katakilla (powder)..	1½ oz.-2 galls. ..	3 larvæ, 2 adults..	15	Ineffective
9	Derrisine ..	Normal strength ..	4 larvæ, 2 adults..	60	Crawled slowly.

Katakilla is manufactured by McDougall and Robertson, Manchester. The Benzole Emulsion was of the Vallo brand. The former at the strength used was wholly ineffective ; the emulsion was also ineffective and Derrisine seems to be the only one of the lot likely to succeed.

TESTS UPON BANANA PLANTS.

On 11th February, 1925, some of the above solutions were sprayed upon banana stools in order to see if the latter were injured. The weather remained uniformly clear and hot to the end of the experiment, 19th February, 1925. Benzole Emulsion at the above strength, Derrisine recommended strength, and Harbas 1-40 were the ones used. No injury resulted. The plants had some foliage and were given a good drenching.

SPRAYING INFESTED STOOLS WITH PYRETHRUM EXTRACT.

On 19th January, 1925, three badly infested stools were drenched with this solution at the strength of 1·32 oz. per gallon water (equivalent to Lot No. 6 in the table on a previous page). The purpose was to see if the fluid penetrates to the larvæ under the sheaths. The following results :—

There were still many young and adults upon the plants and occasionally dead ones were seen. The fluid seeped well down under the sheaths. As

the liquid had not been strained the plants were more or less coated with a thin deposit of the powder. Such larvæ as were struck had the characteristic convulsion.

STRIPPING EXPERIMENT.

Some attention to the treatment of the pseudostem was given and it was hoped that the infestation here could be greatly lessened by stripping off the sheaths and then spraying. However, stripping was attempted with five bearing Cavendish plants and it was found to be impracticable on account of the nature of the plant. The plant itself would be torn away.

RECOMMENDATIONS.

The nature of this pest is more or less diabolical. It is always present and always breeding. As it occurs in all four stages at once and in three or four separate places (namely, upon the fruit and stem as larva and adult, in the fruit and stem as egg, and in the soil as pupa and recently emerged adult), no single treatment can be made to act upon the population of any plant. Thus no sooner would the stem and fruit be cleaned of their external population of young and adult than on the morrow they would be reinfested from the hatching eggs and from the pupæ in the soil. For adults are daily emerging from the soil and eggs are daily hatching from the stem and fruit.

However this may be, the writer was surprised to see how slowly rust developed in the worst-infested plantations, namely those at Chatsworth. Also that it was not until February that treatment became necessary or even effective. Up to that time the colonies seemed to be gradually disseminating without causing a corresponding dissemination of the rust. The recommendations, therefore, are simple enough in view of the foregoing observations and experiments :—

(1) That late treatment is indicated and of the fruit only.

(2) That pyrethrum powder, half and half with sifted wood-ashes, is the most effective insecticide to be used (it kills, is easily applied without carrying or transferring bulky material, and is effective for several days).

(3) That treatment with pyrethrum should be repeated at least four times at 9-day intervals and the powder not adulterated below 25 per cent. ; treatment to begin when the fruit is opening or somewhat later (this in order to kill the first parents).

(4) That all tip fruits be removed and destroyed.

(5) That in the case of suckers to be sent off the plantation, the "stems" (composed of leaf-sheaths) should be removed and destroyed, and the corms (the remaining portion) be cleaned of all adhering soil.

(6) That, as alternative insecticides, Black-leaf 40 at double the recommended strength or Nicotex, or especially either in strong kerosene soap solution should be used. The stronger the soap conveying the nicotine the better, and the less of the nicotine it is necessary to use ; thus it might be reduced by half the quantity. And as an alternative powder flowers of sulphur may be used, mixed with half its bulk of wood-ashes ; but sulphur is not recommended.

(7) That, as far as possible, hand-hoeing about the banana plant should be done ; this for the purpose of exposing the pupæ to the heat of the sun and thus killing them.

SUMMARY.

1. *Anaphothrips signipennis* (Bagnall), described from Ceylon, occurs on the North Coast of Queensland and feeds upon the pseudostem and fruit of bananas. The effect of this feeding is, upon the fruit, a powdery blotching of the skin which, as it increases and ages, turns leathery and becomes more or less cracked. This final effect is Banana Rust.

2. The insect is present through the seasons, never ceases to reproduce, and all stages occur at one time. The egg is deposited under the epidermis of stem or fruit and hatches not until from 12-19 days, the shorter period during the summer. The larva is active, grows to maturity in about a week, crawls to the ground and transforms to the pupa in the soil. The resultant adult ascends from the soil in about another week and commences to feed. It lives a month or more, if a female, laying eggs daily until its death, and in both sexes feeding daily for hours at a time.

3. Each generation develops in about 34 days, so that in continuity about ten generations occur during a calendar year. Actually, there are less.

4. The thrips diminish in number during the winter and gradually increase during the spring and summer, so that by February treatment of the fruit becomes necessary in order to prevent leathering.

5. The Cavendish banana is attacked as soon as the fruit is loose from the bracts ; but the Sugars not until the fruit is a third or more grown.

6. Treatment, owing to the facts set forth in 4, should not commence until late in the season.

7. It should consist of regular powderings of the fruit made with a bulb-blower, using pyrethrum powder half, wood-ashes half, bulk measurement. The time of commencing treatment must be left to the judgment of the planter, but the interval between them ought to be not more than from 8-9 days and the number four or more. If still more treatments are necessary, the increased cost may be compensated for by adulterating the powder to a quarter of the whole bulk.

8. In the meanwhile, all tip-fruits should have been removed and destroyed in whatever way is most convenient or practicable.

9. If a spray is desired, Black-leaf 40 or Nicotex in a strong soap solution should be used and at double or single strength. Suckers sent out from an infested plantation should be cut back to the corm, the stems destroyed, and the corms freed of adhering soil (because pupæ may, by chance, be in this soil).

ACKNOWLEDGMENTS.

The writer is indebted for assistance in the field especially to Messrs. T. P. Reynolds and B. F. Schmidt of Chatsworth. These two gentlemen's plantations adjoin and experiments and observations were freely allowed at all times and without interference. As practical planters they also freely offered advice and suggestions. The Messrs. Long Brothers of Chatsworth are also worthy of mention in this connection for their kindly assistance in various ways. For special assistance I am indebted to Mr. J. H. Simmonds, formerly of this Office, and to the Director, Queensland Museum.

LITERATURE REFERRED TO.

1912. TRYON, H., "Queensland Agric. Jour.," XXVIII., pp. 182-183.
1914. BAGNALL, R. S.—Annals and Mag. Nat. Hist., series 8, XIII., p. 22.

PLATE 87.—BANANA THRIPS (*Anaphothrips signipennis* Bagnall).

Fig. 1.—Larvæ, second stage. 1*a*—Portion of side of abdomen of same, showing the funnelform hairs, one to each segment; greatly magnified. 1*b*—Antenna of same, greatly magnified.

Fig. 2.—Adult female, the wings slightly extended. 2*a*—Antenna of same, greatly magnified. 2*b*—Wings of same, greatly magnified. 2*c*—Greatly magnified scale over the base of the wings. 2*d*—Apex of the abdomen of the female, greatly enlarged, showing the saw-toothed ovipositor.

(All figures enlarged. Drawn by I. W. Helmsing from actual specimens.)

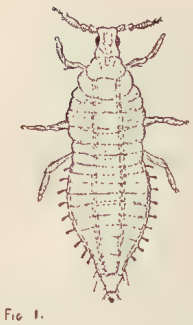


Fig 1.

1a.

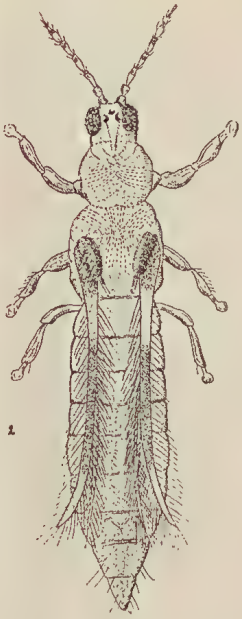


Fig 2

2(a)

Fig 1(b)

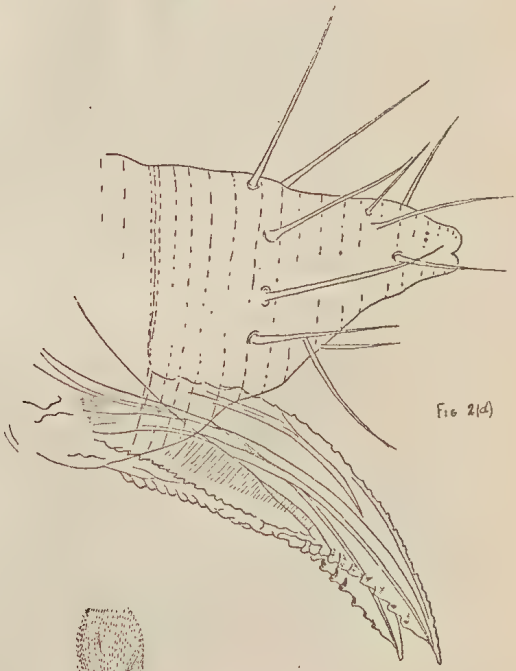


Fig 2(d)

Fig. 2(b)

Fig (2c)

I.W. Kelmsing 1925

PLATE 87.

(*For description of Plate, see page* 516.)

QUEENSLAND AT WEMBLEY.

SOME LESSONS OF THE EMPIRE EXHIBITION.

By H. W. MOBSBY, F.R.G.S., F.R.S.A.

Following my general remarks of the Australian pavilion at Wembley in the April issue of the Journal, it will, perhaps, be of interest, to Queenslanders at least, if we briefly review a visit to the Australian pavilion in search of something to be learned from the exhibition.

The Sugar Industry.

The sugar exhibit, as well as space would allow, depicted the industry from an educational point of view. Strikingly presented statistics and displays of various grades of sugar, from the raw to the refined, were valuable features. A photographic diorama showing sugar-cane cutting in the field was also a bright feature. Below the diorama were three similar panels, the centre one, the map of Queensland, being cut to shape out of a piece of "cellotex" board made with megass (cane fibre residue left after the juice has been expressed), and a piece of whole sugar-cane. On both sides of this panel a map of Australia in white refined sugar symbolised "White Australia." Each map was surrounded with brown moist sugar from Babinda mill. The floor space in this section (occupied by a Melbourne confectioner) was intended for trophies (one of which I was able to set up later) displaying the sugar industry from the "field to the table," and embracing the stages of manufacture in sequence; also the several uses to which sugar is put. Opportunity was taken to describe the industry to visiting school children. General inquiries for cane sugar and statements, such as "Can I buy any cane sugar here?" or "What is going to be done with it at the close?" clearly showed that cane sugar is preferred for its sweetening economy; also probably because it is grown in a British dominion by white labour. When our mills are greater in number and output, and the by-products turned to account by machinery made in Queensland, a greater number of people will find employment in all the branches of the sugar industry. Men of science from the Universities were attracted to the exhibit, and several have already arrived in Queensland to enter on sugar cultivation scientifically and generally. The cinema film of the sugar industry was received in London too late for 1924, and no one will be there from Queensland this year to explain it, as did each State representative at the Panama Exposition, where each of us had two afternoons weekly in the cinema room with films and slides of our respective countries and their industries. The whole sugar exhibit stimulated widespread interest in our cane sugar enterprise, and brought forth many inquiries from important Continental business houses.

Queensland Cotton.

Although our cotton exhibit was originally intended to be of a very different design to that now shown, very good use was made of it to illustrate the efforts of the Queensland Government to obtain or evolve, by scientific methods, the best types for the growers, and to demonstrate its possibilities to those interested—the spinners. Those in the trade who saw the cotton in seed and lint were not slow in saying that we were producing the quality and staple that they desired, that they liked our cotton because it could always be relied on for uniformity each year, and that our system, as explained, of guarding against the introduction of any pests by annual planting was the right one. Panels of combed Durango seed, showing the quality and length of staple, attracted keen interest. Many sound suggestions were made by the spinners in the matter of spinning and manufacture in Queensland from our own grown raw material, especially as Queensland produces 91 per cent. of the cotton grown in Australia. The manufactured calico and sheeting displayed called forth many a remark, "Why doant tha spin tha own?"* The by-products on view, too, got a good measure of attention. All phases of the industry, as illustrated, were much appreciated by visitors, and kept one busy lecturing to the many groups of school children and their teachers. What interested them particularly was a demonstration with a hand-ginning machine which I had obtained on loan from the makers for showing the method of taking the fibre from the seed, and the children took samples of cotton in seed, also the lint, for their own or school museum, labelled "Grown in Queensland." There was a cinema at the Australian pavilion. A fine film, prepared by the Queensland Department of Agriculture for use in England and at Wembley, was, unfortunately, not screened. This film, as well as the film of the Queensland sugar industry, would have been most useful for the Wembley lectures.

*Clothing made in Australia—mixture of cotton and wool—displayed at the Australian Natives' Association Exhibition at Melbourne.

A PEST OF THE SILVER WATTLE.

By Dr. JEFFERIES TURNER, M.D., F.E.S.*

A phyllode of the silver wattle (*Acacia podalyriæfolia*) had been recently received from a well-known Sydney entomologist, showing a round bleb of epidermis detached by some larva, together with several tiny cocoons spun by larvæ after leaving the blebs. It was stated that these wattles had been so badly defoliated

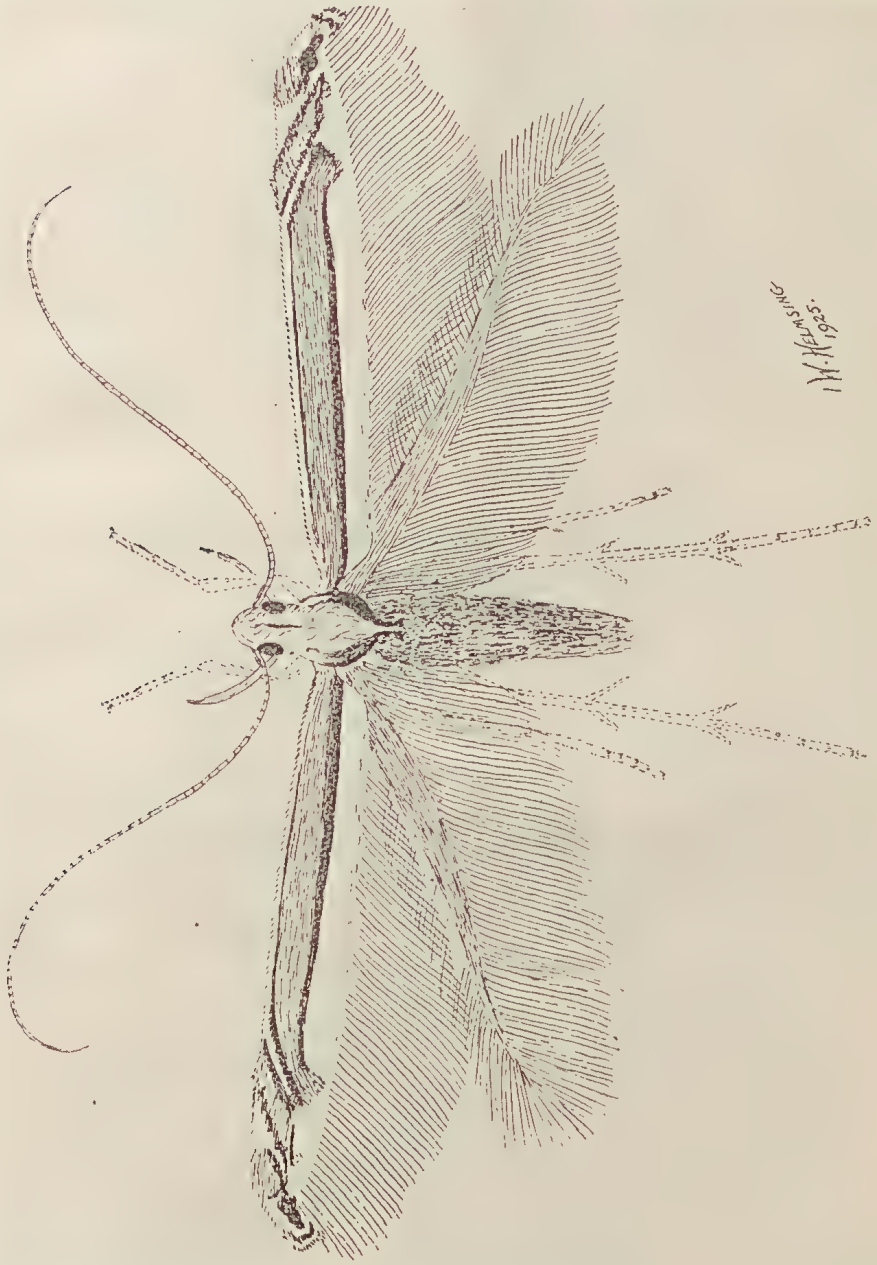


Plate 88.—A Pest of the Silver Wattle.

in the Sydney gardens this season that the future cultivation of this beautiful species in that locality was seriously threatened. The specimens sent were recognised as the work of a little moth belonging to the family Gracilariadæ. Subsequently about thirty dried specimens of a tiny moth, each about one-fourth the size of an ordinary

* A Note read at a meeting of the Entomological Society, Brisbane, 18th April, 1925.

mosquito, were received, which fully confirmed the surmises previously made. It is a species described by Dr. Turner in 1894, Gracilaria (Acrocercops) plebia. Though probably not a rare species in Brisbane, I have seen less than a dozen specimens since that date. It has never been found abundantly here, nor have our silver wattles been observed to suffer from its attacks. This is explained by the fact that wattle grows wild in the country within fifty miles of Brisbane, so with the moth here is probably associated its natural parastic enemies.

What one imagines has happened is this: *A. podalyriæfolia* is easily raised from seed. Consequently Sydney gardens are stocked with trees free from the moth and its parasites. All went well with them until a large bunch of the golden blossom was taken from Brisbane to Sydney, and with it, unwittingly, was conveyed some larvæ in the blotched leaves. These escaped, and being free from their peculiar enemies have multiplied so enormously as to threaten the existence of their foodplant.

To restore the balance of Nature seems here a simple problem. Let some young Brisbane entomologist devote some of his spare time to searching for blotched leaves. If sufficient of these are collected and sent to Sydney, some of them may reasonably be expected to liberate parasites, which in their turn will multiply rapidly and keep the moth in check.

Though this wattle is not, perhaps, of economic importance, it is a great ornament of our gardens, flowering very early in the season, and it would be a great pity to see it exterminated in Sydney, where it grows almost as well as it does here.

WEEDS OF QUEENSLAND.

No. 40.

By C. T. WHITE, F.L.S., Government Botanist.

AMERICAN DOG WEED (*Verbesina encelioides*).

Description.—An annual much-branched sunflower-like weed, densely clothed in almost all parts with rather long white hairs. Leaves green and rather rough hairy above, densely white-hairy beneath, 1½ to 4 inches long, margin toothed or lobed, tapering at the base to a short stalk, the stalk dilated at the base into a pair of small leaf-like expansions (auricles). Flower-heads 1 to 2 inches broad, involcure hemispherical composed of numerous lanceolate-toothed bracts; ray florets 12 to 15, bright yellow, disk-florets very numerous; achenes of the disk obovate, winged, pubescent, those of the ray thick, rugose, and irregularly triangular.

Distribution.—A native of the Southern United States and Mexico. where it is widely distributed as a weed. It has been naturalised in Queensland for some years. and has of late spread over many parts of Southern Queensland, and asserted itself as an aggressive and noxious weed pest.

Common Name.—In America known as "Dog Weed" and "Golden Crownbeard." In Queensland most commonly called "Daisy Weed," also "Wild Sunflower," names, however, applied to a number of other weeds in the State.

Botanical Name.—Verbesina, supposed to be altered from Verbena, which some of the species roughly resemble in general appearance; *encelioides,* from *Encelia,* a genus of North American compositæ, and Greek *eidos,* resemblance.

Properties.—So far as known the weed possesses no poisonous properties; it seems, however, to be very rarely touched by stock.

Eradication.—Being an annual and an abundant seeder efforts should be aimed at the prevention of seed production by hoe-chipping or—in small patches—hand pulling.

Botanical Reference.—Verbesina encelioides, Benth and Hook f. ex. A Gray in Bot. Calif. 1. 350.

Plate 89.—Dog Weed of America (*Verbesina enceliodes*, Benth. et Hook.
A.—Ray floret. B.—Dish floret. C.—Involucral scale.

MOUNT GRAVATT EGG-LAYING COMPETITION.

During April 2,804 eggs were laid, an average of 10·4 eggs per bird. This is an improvement on the average for April in the last test. With the exception of about six cases of mild chicken pox, the birds have been free from sickness.

SECTION 1.

White Leghorns.

Name.	A.	B.	C.	D.	E.	F.	Total.
W. E. Woodward	22	16	23	11	18	17	107
E. J. Stilton	21	18	17	16	21	14	107
B. Driver	20	8	24	10	18	23	103
Eclipse Poultry Farm	24	22	17	14	23	2	102
G. W. Cox	19	17	20	21	19	3	99
Mrs. R. E. Hodge	22	15	8	20	11	19	95
M. F. Marsden	16	13	13	6	20	23	91
John J. McLachlan	19	14	17	18	16	7	91
S. Grenier	21	10	20	4	17	8	80
L. Bird	22	9	..	7	21	18	77
J. Hutton	15	11	10	8	14	19	77
J. E. G. Parnell	12	12	17	15	9	12	77
R. C. J. Turner	14	11	12	13	9	18	77
M. F. Newbury	17	18	17	17	3	3	75
Jas. Earl	19	20	5	8	11	11	74
W. Wakefield	17	13	5	19	17	2	73
E. Anderson	8	10	1	14	16	20	69
W. and G. W. Hindes	11	18	12	10	7	10	68
J. Harrington	9	6	8	15	12	12	62
H. P. Clarke	3	18	2	3	15	10	51
A. S. Walters	8	17	1	5	..	16	47
H. Fraser	..	18	16	4	2	2	42
George Marks	6	10	6	1	12	6	41
T. W. Honeywell	3	..	19	1	11	4	38
Mrs. Clarke	..	8	7	10	8	..	33
T. H. Craig	..	11	7	14	1	..	33
W. D. Melrose	9	13	..	..	2	5	29
Chris. A. Goos	11	3	4	2	..	8	28
Mrs. Lindley	2	6	..	10	..	..	18

SECTION 2.

Black Orpingtons (except where stated).

Name.	A.	B.	C.	D.	E.	F.	Total.
E. Walters	19	11	8	14	19	23	94
Eclipse Poultry Farm	13	18	23	21	7	6	88
James Potter	21	8	19	8	17	15	88
W. and G. W. Hindes	23	3	8	8	18	21	81
James Hutton	20	1	16	14	1	8	60
R. Burns	12	5	7	13	18	3	58
E. Ward	8	7	10	7	16	10	58
T. Hindley	12	8	18	2	17	..	57
Carinya Poultry Farm	16	11	5	4	15	1	52
George E. Rodgers	..	9	13	9	19	1	51
H. Cutcliffe	17	6	9	2	10	6	50
J. Pryde (R.I.R.)	4	14	2	13	5	6	44
Mrs. A. E. Gallagher	..	..	6	2	1	10	19
C. Dennis	..	..	8	..	1	5	14
E. C. Stead (Wyandottes)	3	..	..	11	..	14	
W. D. Melrose	..	1	..	8	2	1	12

THE VALUE OF GOOD LAYING HENS AS COMPARED WITH MODERATE PRODUCERS.

P. RUMBALL, Poultry Instructor.

The following figures which are taken from the Mount Gravatt egg-laying competition for 1924-25 illustrates in no uncertain way the advantages of keeping good producers.

In compiling this table it was only possible to take into consideration the average cost of feeding, although it must be admitted that heavy layers would consume proportionately more food, but the extra food consumed would not be sufficient to make any material difference in the results.

It will be noticed that the good layers produce eggs during the period of high prices, while the moderate layers perform best when eggs are of low value.

During the period of low values the general farm flocks produce at their best, consequently the returns to the farmers are not great. Systematic breeding and feeding are the only means by which a better regulated egg supply can be obtained.

RESULTS OF TWO PENS OF SIX BIRDS.

GOOD LAYERS AND MODERATE.

Month.	Average Market Values.	Eggs Laid (good layers).	Eggs Laid (moderate).	Value Eggs Laid (good).	Value Eggs Laid (moderate).	Average Cost of Feed.	Profit over Cost Feed (good).	Profit over Cost Feed (moderate.
	s. d.			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
April ..	2 3	104	52	0 19 6	0 9 9	0 5 9	0 13 9	0 4 0
May ..	2 7	111	106	1 3 10	1 2 10	0 5 9	0 18 1	0 17 1
June ..	2 0	125	73	1 0 10	0 12 2	0 5 9	0 15 1	0 6 5
July ..	1 8	125	116	0 17 6	0 16 1	0 5 9	0 11 9	0 10 4
August ..	1 1	151	105	0 13 7	0 9 6	0 5 9	0 7 10	0 3 9
September	1 0	154	85	0 12 10	0 7 1	0 5 9	0 7 1	0 1 4
October	1 0	157	100	0 13 1	0 8 4	0 5 9	0 7 4	0 2 7
November	1 1	151	72	0 13 7	0 6 6	0 5 9	0 7 10	0 0 9
December	1 4	145	76	0 16 1	0 8 4	0 5 9	0 10 4	0 2 7
January	1 4	115	75	0 12 9	0 8 3	0 5 9	0 7 0	0 2 6
February	1 7	117	56	0 15 5	0 7 4	0 5 9	0 9 8	0 1 7
March ..	2 1	107	58	0 18 7	0 10 1	0 5 9	0 12 10	0 4 4
Total ..	..	1,562	974	9 17 7	6 6 3	3 9 0	6 8 0	2 17 3

	£	s.	d.
Profit over cost of feed, 6 good layers ..	6	6	3
" " " 6 moderate layers	2	17	3
" " " 1 good hen ..	1	1	0½
" " " 1 moderate hen ..	0	9	6½

CUT WORMS AND CABBAGES.

Writing under date 6th May, the Metropoliton District Council of the Queensland Producers' Association brought under the notice of the Department a matter that had engaged the attention of its members on the previous Saturday, namely—the serious ravages wrought amongst all small crops by cut worms throughout the district, and more particularly to the members of the cabbage tribe. The injuries have been particularly severe, some farmers having lost almost their entire crops of both cabbages and cauliflowers, and accordingly the Council submitted that a special investigation be ordered. The Government Entomologist has supplied the following note to the Minister (Hon. W. Forgan Smith):—

The cut worms that—as I am aware—are those implicated in damaging cabbage and cauliflower plants in Queensland are two species of *Agrotis*, viz., *A. radians* and *A. spina*, and they are therefore not only among the cut worms of other parts of Australia but are also closely related, both systematically and by habit, with those of American, European, and Asiatic countries—not to mention those of the Islands of the Sea.

As may be expected, therefore, investigations regarding the best methods generally for dealing with the cut worm pest have been fully exploited.

Considering the most prevalent of these pests in its injurious relationship to the cabbage tribe—to the members of which, however, it is not confined—there are evidently four broods each season, during the period usually devoted to the growth of plants that it affects—say from September to May; and unless some factor naturally operates to prevent numerical development, or effective repressive measures are pursued by the end of the term—*i.e.*, by May—the insects have become so numerous as to be well-nigh beyond the reach of ordinary methods of control.

Again, I have discovered here evidence of the occurrence of cut worm parasites—especially in the existence of a formidable enemy to the pest, a Tachinid fly; so that we have in this not only a serviceable insect operating in abetting human efforts to reduce the pest, when exercised, but one that is always operating naturally to lessen its numbers—and does so occasionally almost to the limit of its extermination.

Hence it follows that to secure material results in dealing with these cut worms one must search for its presence early in the season of its occurrence, and attack it then—this presence being at this time revealed most readily by the occurrence of the moths, the parents of these depredators, that are to be made to assemble for our observation by means of special appliances involving the use of bright lights, or attractive lures, the nature of which can be specified.

It is now too late in the season to prosecute effective procedures for subduing this natural enemy of plant-life. It will be soon passing into the soil to metamorphose into the chrysalis state, and thus in this non-injurious condition pass the winter through, unless disturbed.

But without going into particulars I may point out what are the methods usually found effective in view of cut worm occurrence. They are these:—

(1) Frequent tillage of the soil, so as to expose the insects therein—caterpillars and chrysalises—to the fatal influence of untoward weather conditions, native birds, and predatory insects.

(2) The use of moveable fowl-houses conveyed over the ground whenever it is being subjected to any preparatory treatment, poultry being partial to this class of insect when once trained to feed upon it.

(3) Trap lanterns (such as are especially used in India) to capture and reveal the presence of the parent insects—the cut worm moths—so also with regard to lures.

(4) Close scrutiny of the soil where turned up in the spring (or at any time of replanting a first crop) in order to detect any cut worms if present; and the avoidance of planting as long as any remain to be dealt with by 1 or 2 or by poisoning.

(5) Laying poison over the whole land whenever cut worms are known to be present in it—to consist of bran or other meal or bunches of favoured fodder to which, after being moistened with sweetened water, an arsenic salt has ben added; or, in the case of fodder, that has been steeped in water in which, say, Paris Green has been mixed.

(6) Trapping caterpillars by placing objects on the ground, under which concealing themselves they may be hand picked.

(7) Further, insomuch as plants other than members of the cabbage or cotton tribe, even certain weeds, are attacked, not to fail to overlook the presence of these either, as affording breeding-grounds for the cut worms, or as complicating general repressive measures directed against them.

(8) It may be possible that cut worm parasites exist in other parts of the world that are capable of destroying the plant-depredators under consideration more generally than do those already present in our own cultivated lands. This is a matter for inquiry, with a view to their introduction if they do exist. However, it does not appear that any one of the numerous countries throughout the world in which destructive cut worms are assertive rely at all on the use of introduced parasites for their subjugation, but rather depend on their own persistent efforts intelligently pursued as the outcome of a well conceived co-operative effort opportunely pursued.

FIELD REPORTS.

(*Continued from page* 470.)

Diseases.—Leaf Scald is the principal disease in this area. The writer was agreeably surprised not to find more of it in ratoon paddocks of N.G.15, where it was noticed previously, probably the very favourable growing period experienced for some months past may have something to do with this, and the ratoons may develop it later on with drier conditions. Such, however, was not the case with the Gorus, particularly with 24B (Green Goru). In nearly all cases where this variety was grown the disease was noticed, but in very few cases had the whole stool perished, a number of apparently sound stalks, even in second ratoons, being left. H.Q.426, where seen, was also looking very well, and did not seem to have suffered so badly.

Mosaic was also noticed to a small extent in some B.208, but the owner intended ploughing this out. It is astonishing to learn of the great proportion of growers who cannot recognise the symptoms of Mosaic.

Hambledon.

At the mill overhauling work has been carried out preparatory to what then looked like a record crushing season for 1925. The mill accounted for the fine total of 160,847 tons of cane for an average of 22·1 tons per acre. Freshwater, with its new rich land, was responsible for the remarkably high yield per acre of 31·1 tons. Its plant gave 40·5, first ratoons 32·2, and other ratoons 25·3 tons per acre.

The seasonal outlook was most promising. All through the area very fine crops of plant and ratoon cane were noticed, all growing luxuriously. In the vicinity of Woree, White Rock, Kamma, and right through the Sawmill Pocket very heavy crops of cane, mostly D.1135, were noticed.

At Freshwater the growing conditions up to then had been ideal, and wonderful growth was observed in all classes of cane. In a couple of places second ratoons Badila five and six months old looked nearly ready for cutting, while some magnificent crops of plant cane promised a 50-ton crop. Although the land is comparatively new throughout Freshwater, it was gratifying to learn that several growers were using beans or cowpea for green crops, while a few growers whose soil was inclined to be stiff were talking of using a dressing of lime.

Owing to the crops being so forward a certain amount of cane had fallen, the effect of wind and the very sodden nature of the ground, and in many cases it was noticed that this cane had "shot" rather badly from the "eyes."

Varieties.—Among the newer ones some extremely good second ratoons H.109, belonging to Messrs. Stewart and Sons of Woree, were noticed, seemingly very healthy. Near by some second ratoon Q.855 also carried a healthy growth. Both of these were growing upon medium to poor ground.

At Edge Hill some August plant H.Q.458 carries very good growth and has stooled out better than this variety generally does. Adjoining is a paddock of first ratoons looking equally well, and present indications would point to about a 40-ton crop.

Oba Badila (first ratoons), carrying its characteristic dark colour, presents a very even crop, both as regards length of cane and stooling qualities.

Mulgrave Area.

Here, as at Hambledon, a proportion of the cane had fallen. With so much continuous wet, cultivation had to be neglected, and naturally a very heavy weed growth was to be seen upon farms that are usually conspicuous for their well cultivated appearance. Naturally, preparations for early planting are very backward.

The season just closed a record crushing of 175,255 tons went through the rollers. Of this total, 46 per cent. was burnt, against 59 per cent. for the previous season, whilst the tonnage per acre worked out as 20·4 tons. For the coming year there is a larger area to be handled, and the cane seems to be well ahead of that for the same time last year.

Principal tramway work under construction:—Clarke's to O'Neill's, 46 chains; W. Trivin's to S. Kene's, 62 chains; Mount Sophia to Fishery Creek, 1 mile 60 chains. Total, 3 miles 8 chains. Whilst up the Little Mulgrave another 20 chains of engine line are also being laid down at end of present terminus.

Away beyond this point two bridges capable of carrying loco. traffic are being put across the Mulgrave River, but this year they will carry temporary rails only.

Varieties in the Cairns District.—Mainly Badila, Clarke's Seedling, D.1135, Goru, Q.813, M.1900, Q.855, E.K.28, B.147, H.Q.458, H.109. The proportion of same at the Mulgrave Mill was as follows:—Badila, 70·4 per cent., averaging 22·8 per acre; D.1135, 23·8 per cent., averaging 16·1 per acre; others, 5·8 per cent., averaging 16·3 per acre. Total, 100.

In several parts of the area it was noticed that some paddocks formerly under D.1135 were growing excellent crops of H.Q.426 this season. In particular, one grower at Wah-Won has a beautiful crop of this cane upon a very poor and shallow low-lying paddock. After each of three deep ploughings he disc-harrowed, picked out the best plants that he could, and used 4 cwt. of Howe's Special Mixture in drills, and obtained a splendid strike. Judicious drainage, very much needed in this 21-acre block, also helped the crop along wonderfully.

This farm is a leasehold, and the way it is worked reflects the greatest credit upon the holder. Several crops of plant B.147 were growing, generally upon medium to poor ground, and so far looked green and healthy, and smaller plots of H.Q.458, E.K.28, and H.109. Q.813 was represented in several places by good paddocks of healthy-looking cane, but they had mostly suffered rather badly from the effects of heavy wind. One of the few faults of this variety is that it is a fairly shallow rooter and thus likely to go over under wind pressure or grub attack. A peculiar thing about H.109 is that among particularly healthy-looking stools a stalk or two may be found with the leaves showing slight markings suggestive of Mosaic. Growers are reminded of the absolute necessity of watching closely for any form of disease and at once eradicating the source of infection.

Diseases.—Although found in most places where seen last season, the subsequent ratoons have so far not suffered as far as expected from Leaf Scald. It may be that the marvellously good growing season has enabled the cane to withstand the influence of the disease to some extent. Drier conditions may cause its reappearance. Top Rot in Badila plant was noticed to a slight extent at Freshwater.

Grubs.—These were seen in several parts of the district, but had not then done general damage. Some farms had suffered severely, both plant and ratoons showing loss alike. Probably the worst part of the Cairns area would be in the vicinity of Meringa, where several paddocks have suffered very heavy loss.

Green Crops.—Quite a number of plots of green manure were noticed, probably to a greater proportion around Aloomba than elsewhere.

Mossman. 18th May, 1925.

83·92 ins. of rain were registered up to the 14th April; Saltwater for the same period had 100 ins. The average for Mossman for the past fifteen years amounts to 96·48 in.

Cultivation was practically impossible, and it looked as if there would be very little early cane planted in 1925. Finer weather set in about the middle of April, and growing conditions improved wonderfully. The crop outlook is very promising.

More green manure has been planted in the area this year than at any other time, but ploughing-in operations were only becoming possible towards the end of April.

The very heavy cost of lime now makes its use nearly prohibitive in this area, but it is manifest that the stiffer soils, especially in some of the low-lying portions, would benefit immensely by its use.

Extensive additions to the mill plant are being carried out.

With such facilities as the Mossman Mill now offers, growers should see that the full supply of cane is provided—a point emphasised by the manager in his last annual report.

The following particulars of last season's crop are interesting:—

Variety.	Percentage of Crop.	C.C.S.	Price.
			s. *d.*
Badila	19·04	13·81	47 0
H.Q. 426	22·70	13·66	46 6
Q. 813	0·41	13·53	46 0
Innis	1·19	12·48	42 5
Goru	4·24	12·31	41 11
M.Q. 1	2·95	12·25	41 8
B. 147	12·03	12·22	41 7
D. 1135	31·89	11·81	40 2
Mixed	5·55	11·84	40 3

The average c.c.s. was 12·64, whilst the average tonnage per acre was 17·08 tons.

The c.c.s. was 2·43 lower than the previous year, and clearly shows that such figures are the result of last season's abnormally wet ending, and emphasises the advisability of growing sweeter varieties of cane wherever possible, more especially when the density figures of Badila, H.Q.426, and Q.813 are compared with the other canes shown in the list.

Variety Plots.—Among the second ratoons at Messrs. Crees Bros., Boondarra Farm, were Nanemo, Orambo, E.K.28, E.K.1, H.Q.409, H.109, 7 R.428 (Pompey), and H.Q.458. Of these, E.K.28, H.109, and H.Q.458 made the best showing. A small plot of the last-mentioned cane, planted in November upon probably the lowest-lying part of the farm, was showing 6 or 7 feet of cane, and stooling well, despite the fact that it had been flooded many times. Its erect growth under such conditions was most marked.

Diseases.—Leaf Scald in N.G.24 B and H.Q.426 was the most noticed, whilst Leaf Stripe in B.147, D.1135, and M.Q.1 was seen; but the very wet state of the paddocks made it nearly impossible to examine them closely. Growers are again cautioned to be very careful of their seed selections.

Pests.—Rats and pigs were also doing their share of damage in the area, the excessive weed growth everywhere giving them every cover.

Grubs.—Grubs were noticed to be doing considerable damage upon a block of plant Badila in new scrub land at the end of the new Whyanbeel tramline. Finer weather conditions may possibly accentuate the damage already done.

Proserpine.

This locality had also experienced far too much continuous rain for several months, consequently the late cut and late planted cane was decidedly backward. Cultivation of all kinds had also been impossible, and practically hardly any early planting had been done. At Banana Pocket conditions were better, and one promising paddock of early N.G.15 was seen upon Mr. Glasson's new area. This farm also has some fine M.1900, H.Q.426, and Q.813 standover. Referring to the latter cane, the growers locally consider that it is a very good cane to retain its density, even when lying down badly.

The ratoons seen in this area were also more forward than most seen elsewhere. The fact that the Pocket is said to be far drier than Proserpine proper, and is, of course, virgin soil, helps to account for this.

Most of the Pocket farmers are ex-army men, and it is a pleasure to see how well they are flourishing.

Upon Quod Bros.' (Up River Farm) a magnificent crop of ten months old E.K.28 was noticed, of a great length and good diameter, and carrying a good stool. This had been manured, and certainly looks a picture.

The ratoons from which the plants came also look a long way ahead of the average. Near by some H.Q.458 upon Mr. E. Moloney's river bank looks mighty well.

At Kelsey Creek some good crops were also seen. One block of plant B.208 upon Mr. Thoroughgood's farm showed really good growth upon medium soil. The following figures of cane crushed during the past two years are of interest:—

1923.			1924.		
Variety.	Percentage of Crop.	C.C.S.	Variety.	Percentage of Crop.	C.C.S.
N.G. 15	8·3	14·4	H.Q. 426 ..	21·0	15·4
H.Q. 426.. ..	28·3	14·0	M. 1900 ..	13·6	14·9
Q. 813	17·9	13·8	Q. 813 ..	21·2	14·6
M. 1900	9·1	12·8	N.G. 15 ..	13·1	14·1
S. Singapore ..	3·6	13·9	Goru	5·4	13·2
Others	10·1	13·7	Q. 1121 ..	2·0	13·6
Malagache ..	8·8	13·0	Malagache ..	6·8	12·9
D. 1135	11·4	12·9	D. 1135 ..	4·1	12·6
			S. Singapore ..	1·7	13·1
			Others	..	..
			Q. 116, Q. 114..	..	..
			Violet, &c. ..	11·1	13·4

giving an average for the two years of—

Variety.	Percentage of Crop.	C.C.S.
H.Q. 426 ..	24·5	14·7
N.G. 15	10·7	14·2
Q. 813	14·5	14·1
M. 1900	10·7	13·9

Pests.—Grub damage seems to be rather more apparent this year, for, despite wet conditions, several farms in the Kelsey Creek area are badly hit, plant and ratoons suffering alike. Q.813, M.1900, and N.G.15 are all affected, the first-named probably showing the most damage. Growers in this area are advised to read up the monthly report on pests published by the entomologist at Meringa; and who is at all times ready to give any information in his power. Opossums were also doing considerably damage to cane in parts of the Kelsey Creek area.

Cane-killing Weed.—This weed, previously reported as present, was also noticed to be still alive, despite energetic eradication efforts. The weed is at its worst in January, late planted cane suffering much more than the earlier, whose extra vigour and growth enables it to withstand the weed effects better than the former. As small portions of the weed can be seen in plant, first and second ratoons, it seems to be a hard pest to get rid of.

Diseases.—Leaf Stripe was noticed upon one farm at Cannon Valley and upon another up river farm; in the first case in an odd stool of 7 R.428 (Pompey) and in the other case in two stools of the same variety. The utmost care should be continually exercised by farmers in seed selection, for otherwise Stripe may spread.

Gum was also seen upon a stool of cane in the Cannon Valley area, the variety affected being Malagache (plant). An odd stool or two of Badila in the Waterson area was noticed to have scald.

SELECTING A BOAR—POINTS TO REMEMBER.

When selecting the herd boar the best available should be obtained, for during his life he may be the sire of hundreds of pigs, while the sow can only produce a limited number. If the boar is good he will improve the standard of the herd, but if he is a mongrel or crossbred he will limit the profits of the pig farmer. His selection, therefore, is of very great importance.

The boar should come from a large, thrifty litter, and be purchased from a reliable breeder. He should be a little more on the compact side than the sow, not too chunky or short, but showing full development at every point, and of a strictly masculine type, representing the full type of his breed. He must show quality, smoothness, and evenness in every part, a typical masculine head, eyes and ears wide apart, and jowl reasonably full and well laid on to the shoulders, which should be smooth and free from wrinkles; there should be a full heart-girth extending well down to the bottom lines, nearly or quite on a level, with as deep a flank as possible; rather short or medium length legs, with bone of fair size and quality, pasterns short and straight, and the hoofs well set, legs standing square, straight, and well under him; a long, wide, and deep ham, and tail well set up.

The disposition and good behaviour of the boar depends much on how he is handled from a sucker until he is matured. Docility is a great point, and the boar should always be handled quietly and kindly. He should be kept in a securely-fenced yard or small paddock, with grass to graze on, if at all possible, and be provided with a dry shed to sleep in, ample bedding in the winter, and plenty of shade and water for the hot weather.

The boar requires to be well fed, but not kept too fat, and he should be provided with ample exercise to keep him fit. He should be kept by himself, and a record kept of when he is mated with each sow.

His feed should be varied and made up from any of the following:—Peas, barley, wheat, maize, skim milk, and kitchen swill as a morning feed; plenty of lucerne, rape, green barley, or mangolds should be given in the afternoon. Clean drinking water, wood ashes, charcoal, and a small piece of rocksalt should always be provided in his pen. With proper care and attention he will be serviceable for about seven years.

SOFTWOOD PLANTATIONS—I.

By V. GRENNING, Rhodes Scholar, Working Plans Officer, Queensland Forestry Service.

Australia imported softwood in 1920-1 exceeding £5,000,000 in value. Industrial expansion and increasing population is strengthening the demand for softwood supplies. The world's stocks of over-mature softwoods are being rapidly depleted, and already the rate of utilisation exceeds greatly the rate of increment. On account of excessive local demand exports from softwood exporting countries must diminish inevitably, and in thirty years, it is estimated, they will have reached the vanishing point. Australia's softwood resources are very limited. Queensland alone can almost meet her home requirements, but when all her over-mature pine has passed through her mills, the increment of under-girth pine will supply but a small percentage of her demands. There is only one solution—plantations of softwoods. That is Mr. Greening's opinion, and his views on this phase of our forestry problem will be read with interest by all concerned in Queensland's timber future.—Ed.

As an introduction I propose to deal with a plantation system of local interest, *i.e.*, the taungya system, a combination of forestry with agriculture. "Taungya" is a Burmese word, meaning literally "hill cultivation," and is becoming a general term to indicate the system.

Sixty years ago, when the first attempts were made to introduce the elementary principles of forest management into the forests of Burma, Dr. Brandis, the first Conservator of Forests, found the prevailing system of agriculture a most difficult forestry problem. The Burman was essentially a cultivator of the nomadic type. Each year a fresh area would be selected, clear-felled, burned, and after the rains, the crops would be sown. Then, having reaped the crops, the villagers would move on to another part of the forest the following year, and the process would be repeated. The best sites were naturally selected, and as these invariably contained the best stands of teak, immense quantities of valuable teak were destroyed each year. It was pointed out to the villagers that they were liable to prosecution for the destruction of the teak, and as an expiation they were allowed to plant teak trees each year along with their cereal crops. This method appealed to the Burman, but the result was a large number of small teak plantations, scattered sporadically throughout the forest. The difficulties of management were greatly increased. To reduce these, villages were concentrated so that a large compact area was worked each year as directed by the forest officer. The teak is now extracted from an area which is then given over to the cultivators.

Teak seeds are sown at a spacing of 6 feet by 6 feet, after which rice, the chief crop, maize, sessamum, and vegetables are sown. A general rate of 8s. per acre is paid to the cultivators for the successful establishment of the teak plants. The system has proved very successful, solving both the forest and agricultural problems. To date 100,000 acres of plantations have been established in Burma, and the area is being extended annually at the rate of 8,000 acres.

This system has been introduced into many countries where shifting cultivation is prevalent and much valuable timber is destroyed. In India, East Africa, and the Philippine Islands the method has proved eminently successful, and it has been practised in Germany for the last century.

The benefits derived from the practice of this method were found to be—

Firstly, from a silvicultural point of view, an easy and safe reforesting as a result of the thorough working of the soil and the continual destruction of weeds;

Secondly, from a financial aspect, the saving of the costs of plantation by reason of the agricultural returns; and

Thirdly, from a political economy aspect, the complete utilisation of the factors of the locality with a consequent production of a considerable amount of food material and the employment of much labour.

After a careful consideration of this system with a view to its practical application to Queensland conditions it was decided that the Cavendish banana was the crop most suited to the scheme. There are certain areas of scrub contained within the limits of the State Forests, the natural regeneration of which would prove difficult and costly. Felling, burning, and artificial regeneration would also be expensive. From a management aspect these areas could not be alienated, but they are sufficiently fertile to allow the profitable cultivation of a rotation of bananas before the establishment of the timber plantation. Bananas have a short financial rotation, during which they speedily exhaust the fertility of the surface soil. After a period of five to seven years the soil on the slopes is so reduced in available food material that a timber crop will yield a much lighter percentage profit than any other crop. Trees make very moderate demands on the soil, especially conifers (most commonly called "softwoods"), which it is intended to grow on a large scale.

Ebermayer, a German scientist, concluded as the result of his researches—

(i.) The substances required from the soil by forest trees are qualitatively the same as those required by field crops.

(ii.) Broad-leaved species require for the production of leaves and wood nearly as much mineral substances as an average field crop, *but conifers require much less.*

(iii.) Further production of wood alone (excluding the leaves) forest trees require much smaller quantities than field crops, *taking on the average about one-fifteenth of the quantity required by the latter.*

(iv.) Almost any soil can furnish a sufficient quantity of mineral substances for the production of a crop of trees *provided the leaf mould is not removed.*

The surface soil will be so improved by the action of the leaf litter from forest plantation that at the end of the tree rotation it will be possible to introduce another banana rotation, and so make the system continuous.

Establishment of Plantations.

Plantations may be established either by the sowing of the seed *in situ*, or by transplanting seedlings raised in nurseries to the plantation area. Because of the high cost of the seed of most species dealt with and the dangers to which the seeds are exposed it is usually found more satisfactory to create plantations with nursery stock than by broadcasting seed. The erratic weather conditions in Queensland made it necessary to evolve a planting tube which enabled the seedlings to be transplanted from the nursery to the plantation site without disturbing the root system.

The development of softwoods, and hoop pine in particular, in plantation formation is generally misunderstood. Light plays a very important part in tree development by its action on the chlorophyll in the leaves. The leaf is the laboratory of the plant, and without light there would be no production of chlorophyll and no assimilation of carbon dioxide and no life on the globe. The vegetative shapes of plants are greatly influenced by the intensity and direction of light. The duration of the life of the branches depends partially upon the intensity of light. The shade cast by the younger branches retards the assimilatory activity of the leaves on older branches, and thus renders impossible the normal development of buds and the ripening of wood. The branches die, become brittle, and break off. As a result of this early suppression of the lower branches, first class timber is produced. A hoop pine tree standing in the open is conical in shape and bears branches from its summit to its base, whereas one standing in dense stands has only a small green crown with a clean cylindrical bole.

The original spacing of the trees at the establishment of a plantation and the subsequent thinning practice adopted determine the quality of the timber produced. The closer the spacing and the slower the rate of removal of thinnings the better will be the quality of the timber produced. But the rate of volume growth of each individual tree is reduced by close spacing, whilst the time taken to reach millable size is greatly increased. Consideration, however, must be given to the financial aspect. By increasing the length of rotation the per cent. profit earned by a plantation is considerably reduced, and the added cost of establishment of closely spaced plantations has the same effect. By increasing the length of rotation the per cent. profit earned by a plantation is considerably reduced, and the added cost of establishment of closely spaced plantations has the same effect.

In Europe a spacing of 5 feet is considered most economical, whilst for Australia, where thinnings cannot always be disposed of profitably and the rates of growth greatly exceed those of Europe, the spacings should not be closer than

8 feet. Naturally, the spacing varies with the rate of growth of the species and its habit. Kauri pine will produce first-class timber at a wider original spacing than hoop pine, whilst for eucalypts, if planted, a spacing of 15 feet or more will probably be found most economical.

The Practice in Germany.

As an illustration of the thinning practice adopted in Germany, the following example is given. In a first class Scotch pine forest the normal number of trees to the acre at the age of twenty years is considered to be 1,420:—

at	40	years	..	..	..	..	720 trees
at	60	„	..	..	..	..	370 „
at	80	„	..	..	..	..	230 „
at	100	„	..	..	..	..	170 „
and at	120	„	..	..	..	..	140 „

If a rotation of 100 years is adopted, then the final crop will consist of approximately 170 evenly-spaced trees.

Life of a tree in a plantation might be divided into—

(i.) The period of establishment.
(ii.) The period of height growth.
(iii.) The period of volume growth.

For several years the plantations show little growth until the canopy begins to close, and a soil protection is created. Then the rate of height growth increased during which time periodical thinnings are carried out to assist the best trees, by increasing the growing space.

When the maximum height growth is attained, heavy thinnings are made in order to allow of crown development of the trees intended to form the final crop. Diameter increment depends upon the surface of the leaf canopy and its activity, hence the increased crown will cause a greatly increased volume growth on the bole which has been cleaned during the period of height growth. The determination of the correct thinning practice requires careful study of the development of the individual tree, and the crown in particular.

Hoop and Kauri Pine.

There is a popular misconception in Queensland that hoop pine and likewise all conifers must be grown in the scrub. Unfortunately, there are no plantations of hoop pine whose growth is so far advanced as yet to disprove this idea. As mentioned above, conifers do not require rich soil—light is most essential, and the majority are fierce light demanders. They are very sensitive to fire, therefore hoop pine is not found growing in the forest, where the soil and light conditions are favourable to its development. Then why does it occur in the dense scrub? The explanation is obvious! The regeneration accrued on the scrub edges or in openings created in the scrub where the young tree always had its crown in the light. As the tree increased in height so did the surrounding scrub growth. It is well known that the edges of the scrub are continually extending, and by so doing create a fire protection to the hoop pine saplings. At the same time, the upward extension of the scrub canopy provides sufficient shade to cause the death of the lower limbs of the hoop pine, thus producing first-class timber.

The length of clean timber depends upon the height and density of the canopy shading the bole of the tree. The factors of the locality determine the height attained and not a mysterious "drawing up," with which scrubs have been unjustly accused.

If hoop pine is planted under a scrub canopy, light must be admitted continuously. The rate of development will depend upon the amount of light admitted, and unless the crowns of the hoop pine trees are kept in the light growth will be extremely slow. If the shade be too heavy the trees will succumb. This point is well demonstrated by a kauri plantation laid down forty years ago on Fraser Island. Lines were brushed through the open scrub, but the overhead shade was not removed. Many of the trees still survive, but have shown practically no growth for forty years.

The conditions necessary for the optimum development of hoop pine and kauri pine can be reproduced in pure plantation. All other growth on the area to be planted should be destroyed, and the softwood species should then be planted at the economical spacing. For the present 8 feet spacing has been adopted.

Exotic Softwoods.

In addition to hoop pine and kauri pine, several exotic softwoods are under investigation to determine which are the most profitable species to grow. Those expected to give the best results are—

1. *Pinus tæda*, the loblolly pine, from the swampy regions of the south-eastern corner of U.S.A.
2. *Pinus caribæa*, the slash pine, the yellow pine of commerce, the most valuable pinus timber in the world, from the moist parts of Florida, and Honduras, where climatic conditions resemble those of the coastal area of South Queensland.
3. *Pinus echinata*, the short leaf pine from the same locality as *pinus tæda*.
4. *Pinus insularis*, from the Highlands of Luzon, in the Philippine Islands.
5. *Pinus patula* of Mexico.
6. *Pinus longifolia* of the Himalayas.
7. *Pinus radiata*, or insignis of California. This tree has grown very rapidly in New Zealand and in the other States. It has also shown rapid growth in Queensland.

Pinus tæda and *Pinus caribæa* appear to be eminently suited to the afforesting of our waste coastal lands, and an experimental station has been established at Beerwah for the purpose of determining the capabilities of these two species.

(In the second instalment of this paper in the next issue Mr. Grenning will discuss forest finance and other phases of his subject.)

MARKETING PIGS IN QUEENSLAND.

CO-OPERATIVE, PROPRIETARY, AND AUCTION SALES SYSTEMS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The subject of marketing is one calling for considerable attention, for unless the farmer secures the maximum returns for his pigs, his percentage of profit will be narrowed down, until possibly the business becomes a non-payable one.

Six systems of marketing are common in Queensland, all of which possess some one advantage or other, viz.:—

(1) The sale of stores from farmer to farmer, either direct or per the auction sale system in saleyards, &c.

(2) The sale of porkers direct to butchers or by auction to farmers or dealers.

(3) Consigning pigs direct to co-operative or proprietary bacon factories for slaughter; this on the payment by result system.

(4) Selling pigs "over the scales" at country saleyards and railway stations to buyers representing proprietary bacon factories, and receiving payment for the animals (dressed weight) on a basis of allowing approximately 30 per cent. as the difference between actual live and dressed weight (*see* reference to this subject later).

(5) Selling pigs under the pooling system as carried on under the Atherton Tableland Pig Pool.

(6) The sale of stud pigs for breeding purposes.

These several systems demand some added explanation for, as already stated, each has its own particular advantage.

Auction Sales.

1. Auction sales of store pigs are called as opportunity offers in practically every centre where pig breeding is carried on, but in Queensland these sales represent a very small proportion of the actual business of marketing, for most farmers fatten their own pigs, and where purchases are made they are usually on a private sale basis. Some centres, however, do quite a large trade in store pigs, and as many as 300 or more stores have been offered at the one sale. The system is capable of considerable extension; indeed, there is no branch of pig farming which offers more scope for development than breeding store pigs for sale. This is a branch of the industry which could be developed along up-to-date lines by breeding the store

Plate 90.—D. P. Hays' First Prize Berkshire Boar, "Hillsia Otto," Sydney Show, 1925.

pigs in districts other than the coastal areas where land is cheaper and where mixed farming is the more profitable vocation. Store pigs produced in these districts and sold for fattening in the metropolitan areas, in the dairying centres on the coast, and in the corn-growing districts here and on the Tablelands, should realise prices showing a reasonable margin of profit to both seller and buyer. This is the writer's ideal scheme of pig production on a large scale.

Farmers in the corn belt are always eager to purchase store pigs at the time their crops are ripening, but many of them are not prepared to breed the pigs throughout the year, claiming that it does not pay—this, of course, on farms devoted almost entirely to corn growing. Dairy farmers are also keen buyers of store pigs during flush seasons, in the spring months, &c. The suburban pig farming business is capable of considerable extension; it is held in check largely owing to the difficulty of securing regular supplies of store pigs. Contractors for receiving the buttermilk from butter factories and surplus whey from cheese factories are frequently on the lookout for suitable lines of stores, and their demands are particularly keen during spring, early summer, and early autumn.

The system of selling store pigs by auction is, however, fairly well understood wherever pigs are bred. In general, store pigs 12 to 16 weeks old and approximately 45 lb. live weight are worth from 20s. to 35s., according to quality, age, weight, &c. Slips, a younger grade, say 10 weeks old and weighing approximately 32 lb. live weight, are worth from 20s. to 25s., while weaners—8 weeks old and weighing 25 lb. to 30 lb. live weight or more—are worth from 15s. to 20s. Younger pigs than this and whilst still in the sucking pig stage, *i.e.*, 6 weeks old or thereabouts, and weighing up to 25 lb. live weight, are worth from 12s. 6d. to 15s. Seeing that breeding sows should, when in full profit, produce two litters per year of at least eight to ten pigs in each litter, of which 70 per cent. should be reared, the business should be a very profitable one.

Sale of Porkers to Butchers.

2. The sale of porkers to butchers direct or by auction is not an extensive one in this State, though it also is capable of considerable expansion. There are certain districts both within the Greater Brisbane metropolitan area, and the suburban areas of the larger country centres, say, Gympie, Maryborough, Bundaberg, Rockhampton, Townsville, Cairns, &c., where the sale of porkers to butchers has become quite a recognised business, though both the Cairns and Townsville butchers draw fairly large supplies of porkers from the Atherton Pig Pool under an arrangement which permits of the sale of porkers in this way. This, by the way, has had a considerable and a beneficial influence on the Northern Pooling System. Closer to Brisbane some of the butchers purchase their porkers by auction at the Enoggera yards, Toowoomba butchers operate largely at the Harristown salesyards, while other centres have their own local arrangements. Some of the bacon factories (the Co-operative Factory at Murarrie, for instance) include porkers on the list of prices paid for pigs each week, for they have a certain demand from local butchers for fresh pork and smallgoods, &c.

The sale of "meat" pigs by auction in Queensland has in recent years been almost entirely superseded by the sale of pigs by actual live weight "over the scales" as is described in the following paragraph, but it is apparent that the demand for fresh pork is becoming more general and prospects point to very considerable numbers of pigs changing hands in these grades. In general, porkers, are quoted as light, medium, and heavy. Light porkers are pigs at from 4 to 4½ months old, say 50 to 60 lb. dressed weight, and valued from 25s. to 45s. or so. Medium weights vary from 4½ months and in weight from 60 to 70 lb. dressed. They are worth from 30s. to 50s., while heavy weight pigs, 95 to 100 lb. dressed and at about 5 to 6 months old, are valued at up to £3 or more.

As to whether it pays better to breed and sell porkers or whether bacon pigs pay best depends entirely upon local conditions, distance from markets, demand, &c. Other conditions being equal porkers pay best, but the demand is far too limited in Queensland to warrant wholesale production of porkers, and at present we do not export frozen pork to markets such as those overseas who draw supplies from New Zealand and elsewhere.

Consigning Direct to Factories.

3. The system of consigning pigs direct to the bacon factory whether co-operative or proprietary has its advantages, and especially in the case of co-operative factories is preferred by a large number of farmers. It is a system in which payment by actual result operates, that is to say—the farmer receives payment for the actual dressed weight of pig received by the factory, the price varying according to the

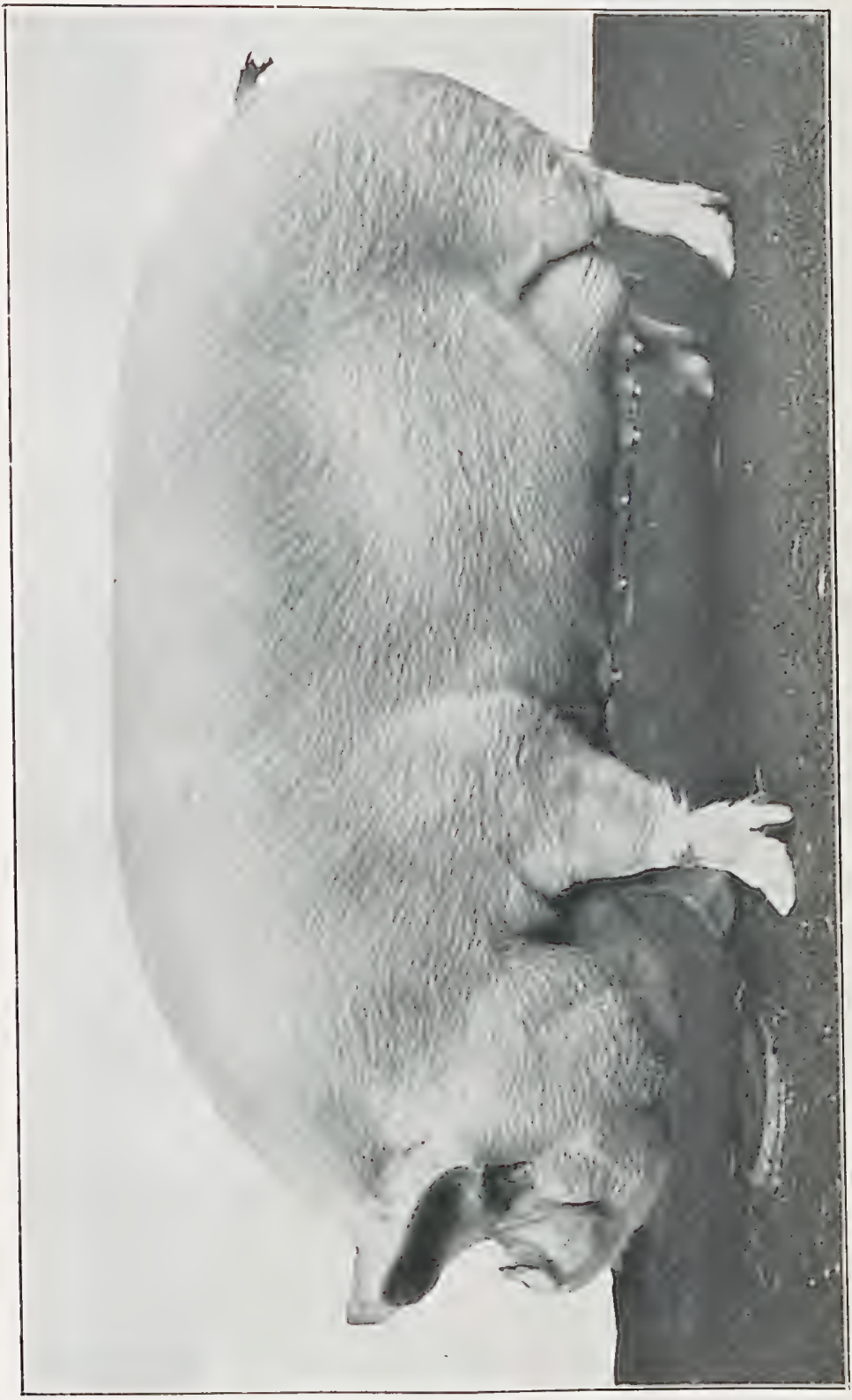


PLATE 91.—Mr. Joyce's Reserved Champion Sow, "Leona," Middle Yorkshire, Sydney Show, 1925.

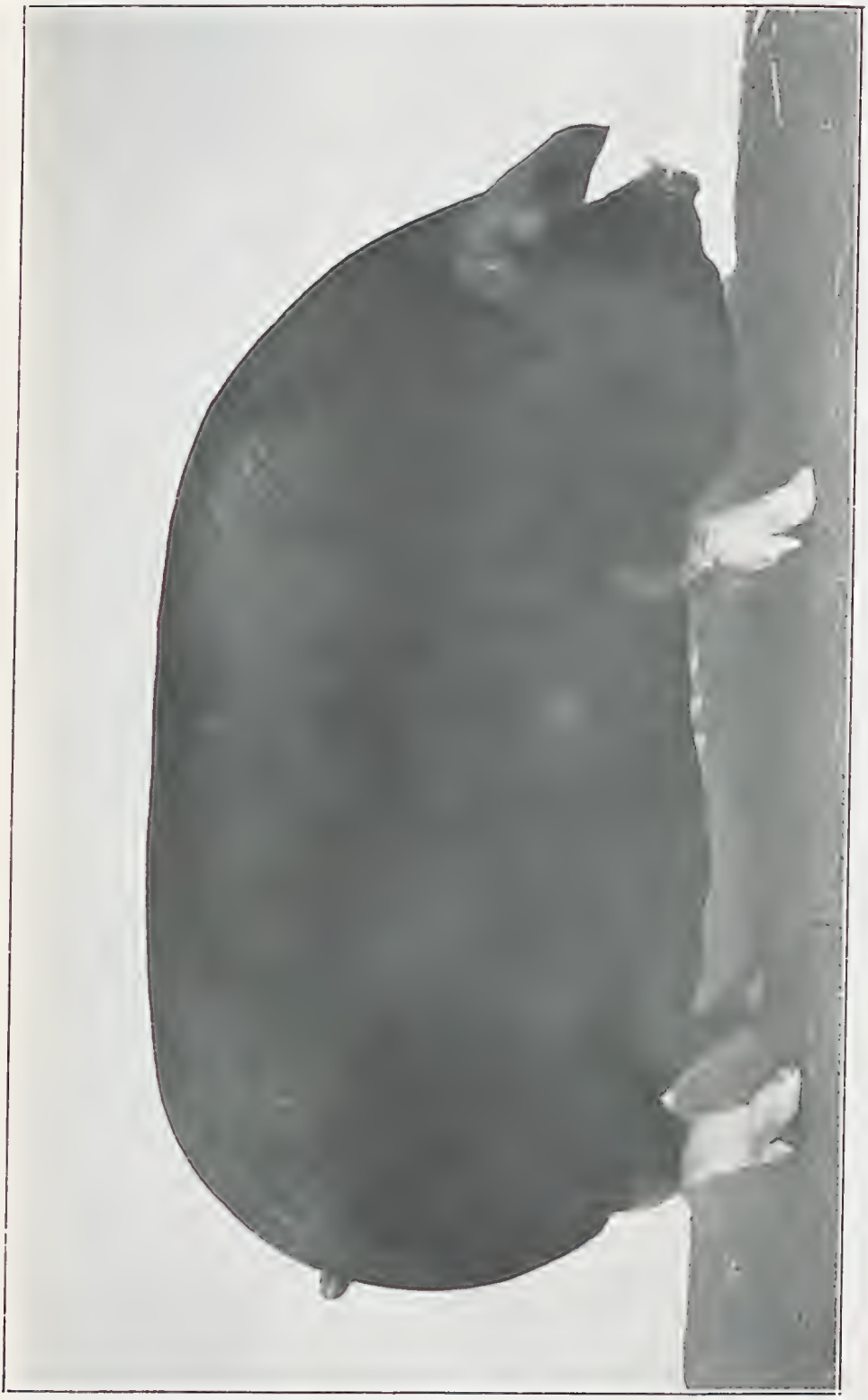


PLATE 92.—MR. T. R. BROWN'S POLAND-CHINA SOW, "DANESBORO' WINIFRED," RESERVE CHAMPION, SYDNEY SHOW, 1925.

grade into which the carcass is classed by the foreman of the slaughter-house, factory manager, or other officer.

In cases where a farmer, who is not a shareholder, consigns his pigs to a co-operative factory, he either receives the full market value of each carcass or he receives an advance payment representing the price per pound the factory is actually paying; other balance (if any) in the form of a bonus at the end of the financial year is paid into share account, thus many co-operative factories automatically enrol new shareholders. The farmer holding shares in the factory receives the advance pay for his pigs and later on his share of bonus either in cash or additional shares or as may be arranged.

Farmers supporting co-operative factories claim this system as the ideal one and certainly from the standpoint of co-operation it has many attractive features. Unfortunately, however, many co-operative factories lack sufficient financial backing, and this coupled with the fact that there are many backsliders amongst those whose money is invested in co-operative concerns, makes the problem of competing on even terms with other factories having a more liberal banking account a very difficult proposition.

Nevertheless the system is a good one and there are not many who would go back to the old days of marketing pigs in Queensland.

The co-operative factories have "Official loading agents" in the various pig-raising centres. These officials are mostly prominent local auctioneers who act as representatives for the companies and receive and truck the pigs to destination. They make all local arrangements *re* trucking, &c., and advise the companies accordingly. They are usually paid a commission—like say one shilling per pig—for this work. They also enrol new shareholders and sometimes act as "commercials" in the sale of bacon, ham, and small goods.

One very important and very necessary part of this system of selling pigs is that the farmer—or the official loader—is compelled (by circumstances in this case) to fire brand, earmark, or otherwise distinguish the pigs before trucking so that on arrival at the bacon factory each individual consignment might be picked out. This is a feature well worth adoption by proprietary factories also, for in addition to indicating ownership in so far as seller and buyer are concerned, it enables the Meat Inspector to trace unmarketable or diseased carcases, and this in turn enables the Veterinary Staff of the Department of Agriculture and Stock to assist the farmer in cleaning up his herd and in culling out unsatisfactory animals and improving the conditions generally on the farm.

Regarding rail freights and incidental expenses, the co-operative factories make the necessary arrangements and the agents and each farmer pays his share of freight and expenses. These factories also have a condemned pig fund, a further reference to which is made in the concluding paragraphs of this article. There are three co-operative factories in Queensland—the Queensland Co-operative Bacon Association, Limited, at Murarrie, the Darling Downs Co-operative Bacon Company, at Willowburn, and the North Queensland Co-operative Company, at Floreat Siding, Mareeba, near Atherton.

Some of the suppliers to proprietary bacon factories prefer to send their pigs direct to the factories for slaughter and for payment by result, but in most instances the pigs are weighed over the scales as mentioned in the next paragraph.

The Weight "Over the Scale" System.

4. The system of selling pigs "over the scales" at country saleyards, railway stations, &c., has in recent years been almost universally adopted by the proprietary interests in Queensland.

For this purpose the proprietary bacon factories install lock-up weighbridge scales at the various trucking centres, the key of the box enclosing the scale bar, weights, &c., being in the keeping of the buyer as well as of the local representative, for most of the proprietary concerns have local representatives looking after their interests. These officials attend to trucking, &c., as in the case of the co-operative factories.

The system operates as follows:—First, in order to reduce expense and limit the number of buyers, the various proprietary factories in Queensland, viz., J. C. Hutton Ltd at Zillmere, Foggitt, Jones Ltd. at Oxley, Reeds Ltd. at Ann street, Maryborough, the Warwick Bacon Company at Warwick, and Conaghan Bros. Ltd. at East street, Rockhampton, are united for the purposes of buying, &c., under the trade name of Stock Agents Ltd., with registered offices at Roma street, Brisbane. Stock Agents Ltd. control the buyers as well as arranging distribution of supplies. Their representatives meet regularly for the purpose of determining upon the price

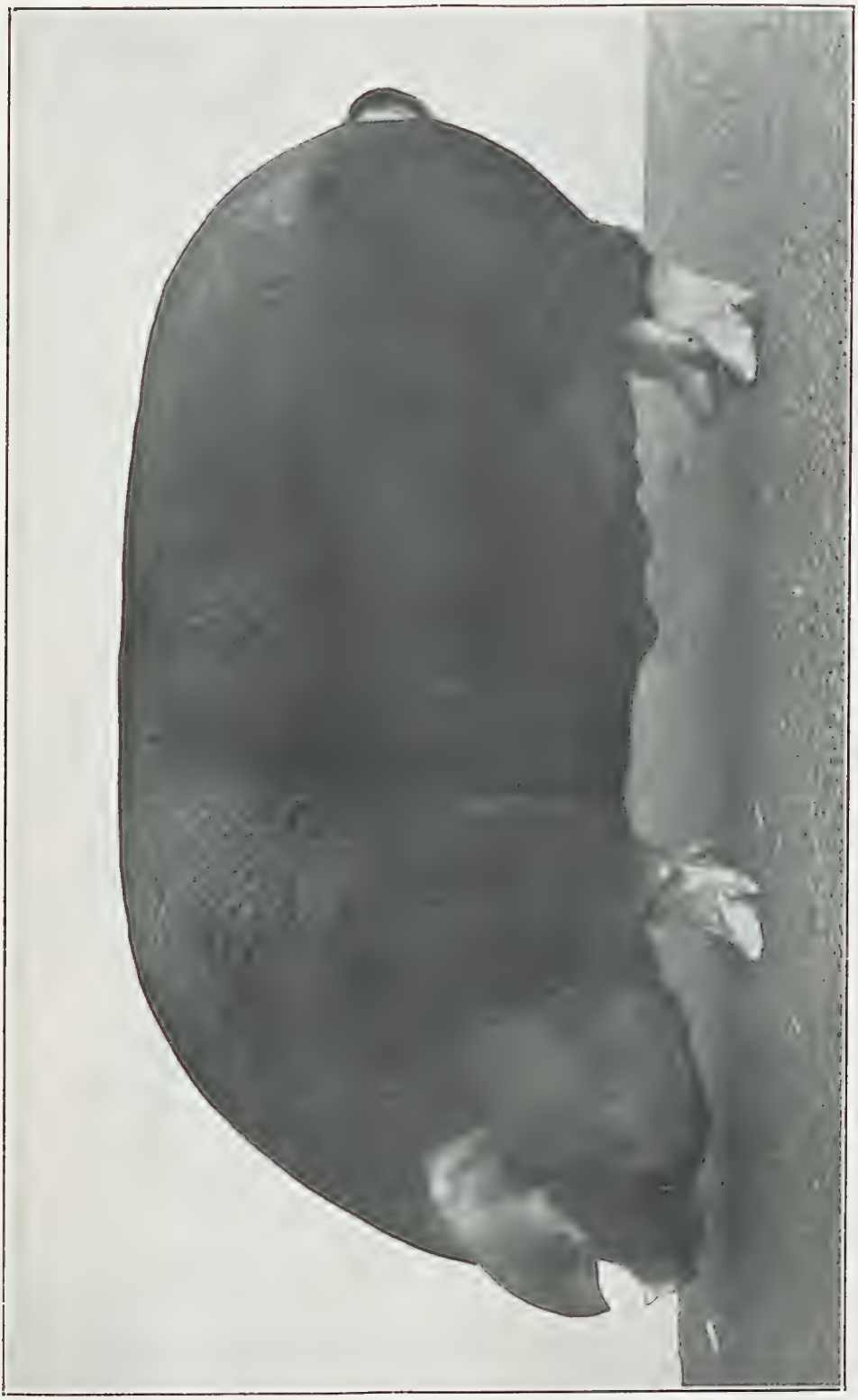


PLATE 93. MR. T. R. BROWN'S POLAND-CHINA SOW, "DANESBORO' JUDY," CHAMPION, SYDNEY SHOW, 1925.

Plate 94.—A Pair of Poland-China Beauties, Sydney Show, 1925.

to be paid for the various grades of pigs as weighed "over the scales," payment in this case being for the pigs on an estimated dressed weight basis at the factories.

To arrive at estimated dressed weight the pigs are actually weighed, the live weight and grade being recorded in the buyer's stock receipt book. A chart has been prepared showing the actual difference between live and dressed weight. This chart allows for a percentage, varying between 25 and 32 per cent., as representing actual loss in offal at slaughter and actual shrinkage in weight during transit and after slaughter up to the time the carcass is weighed at the factory. See further reference to this in concluding paragraphs in next issue.

There is no condemned pig fund in operation at these factories, consequently the companies have to bear all losses both by death and in transit. Fortunately very few pigs actually die in transit.

(To be continued.)

FROST PREVENTION AND CURES.

By HENRY A. TARDENT.*

The great dangers of a warm, humid winter, like the present one, is that the sap of plants, mistaking the season, sets in motion too early. Buds burst forth, young leaves, flowers, and even fruits appear much too early, with the result that not infrequently a late spring frost causes great havoc in gardens, orchards, and fields. Even wheat, which grows in Siberia and in other very high latitudes, is at certain stages of its growth very sensitive to frost. Many an old farmer still remembers the disastrous frosts of 2nd, 3rd, and 4th October, 1899, which caused great injuries to the wheat crops of the Darling Downs and other western districts.

The question confronting us is: "Can anything be done to prevent or cure such disastrous visitations?" At first sight it seems to be a hopeless task. In spite of all our effort at subduing Nature, meteorological phenomena such as drought, rain, hail, and frosts are still beyond our control. We know of no means by which we could prevent a wave of cold from sweeping over the continent. But we can take many steps to prevent and minimise its ravages."

Meteorology is now in a position of forecasting a frost from twenty-four to forty-eight hours in advance with almost absolute certainty. Even those farmers who are out of reach of the daily forecasts issued by the Federal Bureau of Meteorology can foresee a frost by the exercise of some judgment and observation. Old residents have noticed that a wave of more or less severe cold is nearly every year visiting the State about the first week in October, and not seldom as late as November, when vegetation is in full swing. When at that time the wind blows from the west or south-west, it is a sure sign of a considerable fall of temperature, especially when the sky remains clear.

Repeated observations put beyond doubt that when a farm is situated, say, at the foot of a hill, the temperature is towards the morning much colder in the lower parts of the farm—in the hollow along the bottom of the valley—than it is on the top of the hill. Even dumb cattle have noticed that, for on a cold night they will invariably work their way up towards the top of the hill. This tends to prove that during the night there is a double current of air between the low-lying and the higher situated places; that is, the warm air (during the day the air is warmer in the valley) ascends the hill, while the cold air descends from the top. By establishing living hedges across the declivity we can impede that double current and improve the climate of our farm by at least from 5 to 8 degrees, which is usually sufficient to prevent any harm being done by frost.

In gardens, and even on fairly large plantations, pineapples and other delicate plants may be protected by covering them with a handful of hay or dried leaves.

For reasons too long to explain here, the real damage, the irreparable havoc—namely, the bursting of the vegetable cells—takes place at or near sunrise. This may sometimes be prevented by sweeping off the white frost with a broom or a brush, or by dragging a long rope, held in the hand at both ends, all over the rows of potatoes, tomatoes, beans, or even fields of cereals. Another fairly safe method is to dust lime

* In "The Queensland Magazine."

over the plants or water them with tepid water, both of which means dissolve the frost before it has a chance to burst the cells.

For certain plants, like, for instance, the grape vine, Nature has made provision to neutralise the effect of a late spring frost. There is next to the main bud a spare bud—what the French call "faux bouton"—which will develop and bear fruit when the main shoot has been destroyed. All one has to do is to prune off the damaged wood.

But of all the means of preventing damage from frosts, the safest and easiest to practice is by creating artificial fogs or clouds of smoke. That means is practised from time immemorial in my native country of Switzerland, where late spring frosts are often very destructive to the grape vine and other delicate crops. The communal spirit being there highly developed, the local authorities prepare in advance heaps of firewood and other fuel material in certain suitable places, to be lighted when the barometer indicates danger from frost. My esteemed friend, the late Dr. Olssen-Seffer, who has written a treatise on frost prevention, informed me that similar means are also used in his native country of Sweden.

In California, our American cousins went, I heard, a step further. They connect those heaps of firewood with stretched wires. At a certain degree of frost the contraction of the wires by the cold sets fire automatically and simultaneously to all the wood heaps.

Here in Queensland great losses are occasionally caused by late frosts to sugar-cane growers in certain districts like, for instance, the Isis, the climate of which has lost a few degrees since the disappearance of the scrub.

With a view to prevent those losses, I volunteered to give, a few years ago, a lecture on frost prevention to the Isis canegrowers, who turned up in great numbers to attend it. Some canegrowers, having expressed some doubt about the feasibility, and even the efficiency, of the means I advocated, I offered to give a practical demonstration. Heaps of fuel were prepared in the places which I indicated. On a fairly cold morning about a dozen canegrowers turned up between 2 and 3 a.m. and set fire to the fuel heaps. The manager of the Isis mill, the genial Mr. Elm, if I remember well, a Scandinavian who knew the value of smoke as a preventive of frost, put at my disposal several light locomotives. Those locomotives, dragging small wagonettes loaded with oil drums filled with burning tar—an excellent material, giving dense clouds of heavy smoke—were circulating in every direction on the Isis tramlines. This was probably a world record in frost prevention experiments. At daybreak the whole of the South Isis Valley, the topography of which lends itself admirably to such an experiment, was covered with a dense artificially produced fog, which was spread like a canopy over the whole district, fulfilling the double mission of preventing the evaporation of the soil's warmth and the destructive effects of the rays of the rising sun.

The demonstration was conclusive, and satisfied every person present except one. A wealthy landowner who had taken no part in the experiment appeared at sunrise on the spot. "I can see," he said, "that smoke clouds are an effective preventive of frost; but how could I, for instance, stop the morning breeze from blowing *my* smoke over my neighbour's land?" Such a display of selfishness aroused my indignation and contempt.

"The only way I can suggest," I answered, "is for you to brand your smoke so that you can recognise it anywhere and shepherd it back on to your land. In any case, there is not much of *your* smoke in the artificial cloud spread before us."

If I quote that case it is because it is precisely typical of that individualistic selfishness which has prevented for so long canegrowers and other primary producers from joining their efforts to combat the destructive effects of frost. But now that there are everywhere local producers' associations, those producers may be prevailed upon to act collectively. If they were preparing in advance fuel heaps under the direction and indication of experienced men there would not be a single acre of cane frosted in the Isis, at Gin Gin, Mackay, or any other district where frosts occasionally occur. They could even apply to the military or naval authorities, who would probably supply them, if not free, at least at cost price, with the chemicals now used so successfully to produce smoke screens in both naval and land warfare.

But if collective action is not possible from any cause whatever, that is not a reason why an individual farmer should not make an effort to save his crops. When, in years gone by, I was farming in Western Queensland, where spring frosts are of fairly frequent occurrence, I have many a time saved with smoke clouds my grape vine or early crops of potatoes, tomatoes, cucubitacea, and other products liable to be damaged by frosts. And it is written in the Book: "Thou go and do likewise."

SOME OF THE CAUSES OF LOW-GRADE COTTON.

By E. BALLARD, B.A., F.E.S., Commonwealth (Cotton) Entomolgist.

In this article Mr. Ballard calls particular attention to two insects whose activities often escape observation and whose powers of destruction are not appreciated by cotton-growers. These insects are the harlequin bug or Chinese bug, and the more sombrely coloured large cotton stainer. The author's notes have an especial interest for all engaged in the cotton industry.—Ed.

One of the reasons for cotton being classed in a low grade is the presence of stain.

This stain may be brown or yellow, sometimes black, but the brown or yellow stain is the most usual. It is generally found that these stained samples contain short weak fibres, and in the case of seed cotton, the locks from which they are picked are often hard and inclined to be matted. The seeds are, in many cases, deformed, and if cut open it will be found that their contents are much shrunken or have even disappeared.

If a number of green bolls about three weeks or a month old are examined by being cut open, a certain proportion will be found to contain in one or more locks a yellow slime instead of the white maturing lint. A further examination of the inner side of the boll wall will show excrescences, and the seeds and developing lint in the neighbourhood of these excrescences will be stained yellow or brown. As the bolls ripen the stained locks are often deformed. The lint is very short, weak, and stained. Similar symptoms are displayed by bolls which have been attacked by any of the boll worms, the infection often spreading from the attacked lock to neighbouring locks.

It would be as well to explain at once to what this infection is due. The staining and deformity are due to the action of fungus* and bacterial diseases which enter when the boll wall is punctured or similarly damaged. So long as this has not taken place the fungi cannot enter. These fungi are known collectively as internal boll rots.

These internal boll rots are specially prevalent under humid and warm atmospheric conditions, but have only been very slightly studied in this country. In the West Indies and in West Africa they play an important part as one of the limiting factors in cotton production. Under coastal conditions in Queensland, and to a slightly less extent inland, they are equally important.†

Boll rots following on boll worm attack extend the damage already done by the grubs, and even a small nibble which has penetrated the boll wall but gone no further will be sufficient to make the whole boll worthless. Internal boll rots follow into the boll attacks by (1) maize grub, (2) peach moth, (3) rough boll worm, (4) pink boll worm, and (5) Eucosma (an insect for which we have no common name in Queensland). The damage done by all of these—with, perhaps, the exception of the pink boll worm—is obvious, and in most cases well known to any cotton farmer; but this article is intended to draw attention to two other insects whose activities often pass unnoticed and whose powers of destruction are not appreciated by many cotton growers.

The two insects in question are—The harlequin bug or Chinese bug (6), whose brilliant colouring makes it so conspicuous an object, and the more sombrely coloured large cotton stainer (7), which is usually to be seen running about in couples either on opened bolls or on the ground. The red-coloured young ones or nymphs are to be seen everywhere in open bolls feeding on the seed.

(1) *Heleothis obsoleta*, (2) *Dichocrocis punctiferalis*, (3) *Earias hugelli*, (4) *Platyedra gossypiella*, (5) *Eucosma plebiana*, (6) *Tectacoris lineola* (*banksii*), (7) *Dysdercus sidæ*.

The Chinese bug is often called a beetle. It is not a beetle, but a bug, feeding on plant juices by piercing the plant with its proboscis.

The proboscis of the Chinese bug is very long ($\frac{3}{4}$ in. to 1 in.) and it is capable of being thrust right through the rind of a boll and into the seed underneath.

* Chiefly *Fusarium moniliforme*.

† There is no doubt as to their importance, but much study is required of their response to atmospheric conditions.

Chinese bugs can often be seen with the piercing stylets of the proboscis plunged into a boll "up to the hilt." When the proboscis is withdrawn, either on account of the insect's being disturbed or because it wishes to feed elsewhere, a little plug of tissue follows the stylets and can be seen sticking up from the wound. Later, on the inner side of the wound a callus or excrescence forms, but in the meantime fungi and bacteria have entered and before the wound is closed they have got to

PLATE 95.—COTTON BOLL ATTACKED BY BOLL ROT.

work on the developing lint and seeds. Much indirect damage is done to the seed, but often the bug pierces a young seed as well as the boll wall, destroying the embryo inside it.

It will be seen from what has been stated that the Harlequin or Chinese bug constitutes a very real danger. Not only is the cotton lowered in grade by its activities, but there is an actual loss of lint as well. The Chinese bug first comes to the cotton about the time squares are beginning to form, and only leaves it when it is ploughed out or pulled up.

It feeds as readily on the seeds from the open bolls as on the green bolls or the leaves. It differs in this from the next insect I wish to consider—the large cotton

stainer. This insect is not found on the cotton until the first bolls have opened. Until then it lives on Malvaceous weeds. It prefers to feed on cotton seed, and therefore is to be found generally in the open bolls, but it feeds readily on green bolls as well, and once it is attracted into the field will be found on both ripe and unripe bolls.

It is more numerous and appears to breed more rapidly than the Chinese bug, but it is not in the cotton for so long. When feeding on green bolls it too lets in boll rots. Not being so large an insect as the Chinese bug it is capable of less damage, but it is for all that not to be despised.

Any extended field observation would confirm the statements made above, but at the Cotton Research Farm at Biloela this season an experiment was planned to fix the responsibility for the propagation of boll rots definitely on to these two bugs. Various species of other bugs are always to be found on the cotton in small numbers, but not being very prevalent they need not be considered at present.

It is not necessary to give a detailed description of the experiment, as that is to be published elsewhere, but a summary of the results will suffice. The method followed was to enclose single flowers free from all insects in cages so designed as to give light and air but allow no insects to get in which were not intended to be there. In twenty of these for the space of seven to fourteen days were let in Chinese bugs, generally one in each cage, but in one case two. The bolls were at the time from fourteen days to three weeks old. Twenty others had cotton stainers in them, and more were kept as controls by which to check our results. Shortly after the experiment was set going a period of hot dry weather set in, and, moreover, the rainfall at Biloela was most meagre. Conditions were therefore against the production of much fungus disease.

Owing to various casualties not twenty but nineteen cages of each kind were used for the experiment. The results were as follows:—

Chinese bug cages, 19 bolls—15 stained and damaged, 4 very slight stain.

Cotton Stainer cages, 19 bolls—10 stained and damaged, 5 very slight stain, 4 free.

Controls, 25 bolls—All unstained except one, and that was found to have a hole in the cloth of which the cage was made.

It was estimated that the cotton from these attacked bolls (Chinese bug) would be penalised at least 50 points on the Liverpool market owing to stain alone.

Before closing I will give one example showing what Chinese bugs and cotton stainers can do. A certain field on the coastal area contained 30 acres of cotton, and an estimated Chinese bug population of two per tree, not counting eggs and young ones (180,000 bugs in all). Cotton stainers were also much in evidence, but no attempt was made to estimate their numbers.

A count was made of green bolls half grown, and from which the second picking should have been obtained. Fifty per cent. of the green bolls were infected with internal boll rot, 27 per cent. more with boll worm (peach moth) and internal boll rot combined, and 6 per cent. more with pink boll worm, in some cases attended by boll rot but not in all. The chances of a second picking from this crop were not bright.

Having pointed out the disease, one will now be asked for a remedy for it. For the Chinese bug hand picking affords a cheap and effective remedy.

Adults and young bugs are very easy to catch and seldom move about much. Egg masses laid in clusters around the leaf stalks are easily seen and destroyed.

This picking should start early and be thorough. For Dysdercus, or the cotton stainer, so far we have no remedy really suitable for Queensland conditions, but hope to get one by next season.

In another article I will tell of the damage done to cotton seed by these two bugs and by the small dusky cotton stainer (8).

(8) *Oxycarœnus* sp.

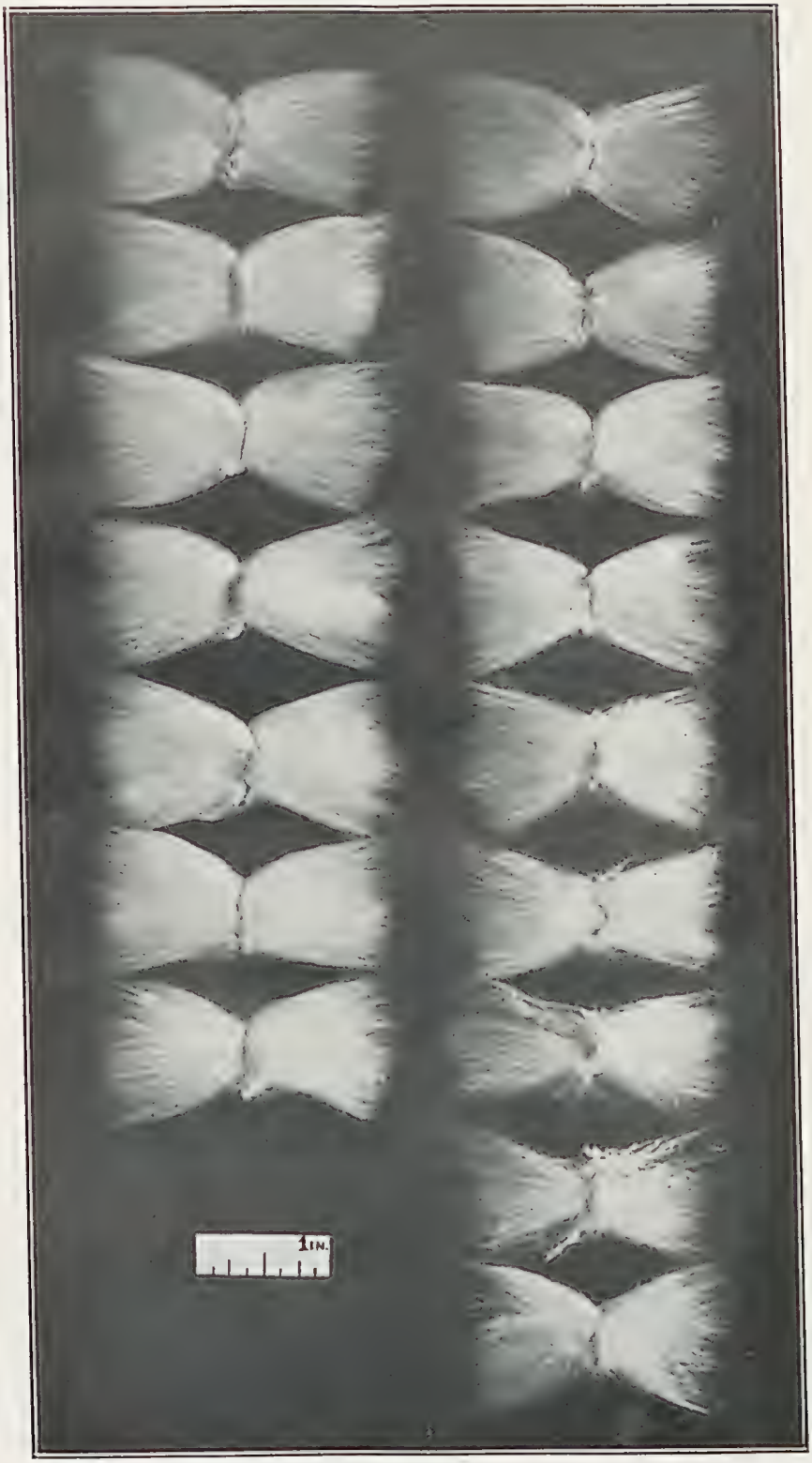


PLATE 96.

Left—Seeds from normal lock. *Right*—Seeds from attacked lock

CARE OF HOME-SEPARATOR CREAM.*

CAUSES OF BAD CREAM.	THE REMEDIES.
1. Unhealthy cows	1. Don't separate the milk from a cow which has not been cleansed or is otherwise unhealthy.
2. Feed-flavours	2. Most feed-flavours can be partly removed by cooling and stirring, the exceptions being turnips, garlic, and similar flavours.
3. Dirty sheds and yards ..	3. Milk absorbs flavours from dirty surroundings. Where machines are used the air is actually admitted into the milk-pipes. Hence unclean surroundings mean bad-flavoured milk.
4. Careless milking	4. Teats and udders must be washed with a clean cloth and clean water from a clean bucket, and then dried before milking. Water must also be provided for washing the milker's hands.
5. Dirty milking-machines ..	5. Milking-machines must be treated as advised in special instructions issued by the Department.
6. Unclean utensils	6. Buckets, separators, &c., must be rinsed with cold water, scrubbed in warm water with a brush, cleanser to have been added to the water, then scalded with boiling water immediately after separating.
7. Washing separator once daily	7. A separator which is washed only once daily is a direct loss to the owner, as it will not skim clean the second time it is used, and will taint all the cream passing through it.
8. Skimming too thin	8. Skim a cream containing about 40 per cent. of fat; it will carry well, and will not quickly develop bad flavours.
9. Not cooling cream	9. Run the cream over a small cooler as it leaves the separator. Attach the water-inlet hose to the lower end of the cooler. Stand it in cold water afterwards.
10. Not stirring cream	10. Stir frequently with a metal plunger, but don't use a wooden stirrer.
11. Mixing hot and cold cream ..	11. Never mix hot and cold cream. Use a clean can or bucket for each skimming, and keep them separate if possible until sending to the factory.
12. Holding cream in kerosene-tins	12. Kerosene-tins are not suitable for use in a dairy unless the seam round the bottom and the lap round the top have been properly soldered.
13. Dirty and badly ventilated separator-rooms	13. The separating-room must be kept as clean as a butter factory, and have at least two large ventilators—one at the bottom and the other at the top on opposite walls—and should not be placed near the yard. The engine must not be in this room.
14. Keeping cream too long before sending to the factory	14. Don't fail to send the cream away on the days arranged by the factory, daily if possible.
15. Leaving cream standing in the hot sun	15. Protect the cans from the sun while waiting for the collecting wagon.
16. Rusty cans	16. Rusty cans impart a most objectionable flavour to cream. Have them retinned.

DON'T use the separating-room as a general storeroom. Don't use a cloth to wash tinware; use a brush. Don't use sandsoap for scouring tinware. Don't use a cloth strainer unless you wash and scald it daily. Don't use the cans returned from the factory until you have scalded them. Don't mistake WARM water for BOILING water.

—Dairy Division.

* "New Zealand Journal of Agriculture."

TREES FOR SHADE AND SHELTER.

Many stock-owners do not appreciate to the full the value of shade and shelter. A little rough hill on the property, covered with stunted gum-trees, is worth more to the farmer as it stands for shelter purposes than the small amount of grass it will grow should he decide to have it rung. To the settlers in naturally clear country judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

While the months of June, July, and August are the usual months of the year for general planting, palms, evergreen trees, and shrubs may be planted now, especially on the tablelands and bleak positions on the coast, so that the roots of these newly-planted trees may become established while there is still warmth in the soil.

The benefits of planting early are many. One does not then get the leavings of the nursery stocks, while young trees, the roots of which may have become established by the time they enter their first summer, have a very marked advantage over those planted in chilled soil and compelled to wait for the heat to start them into root growth.

If actual plantings cannot be made at the present time, the ground should at least be prepared and plants ordered, so that plantings may be made directly after any rain that may come.

BALANCED RATIONS FOR FEEDING DAIRY COWS.

The food of the cow must be ready made and composed of such materials and in such proportions as will maintain body temperature, provide for milk production, and make good the waste of tissue that is constantly going on. The nutritive portion of the food may be divided into three parts—protein, carbohydrates, and fat. A well-balanced daily ration for a cow in milk weighing 1,000 lb. without any additional food in the way of grass should contain 24 lb. of dry matter, 2·5 lb. of protein, 12·5 lb. of carbohydrates, and ·5 lb. of fat.

A ration composed of these will give a nutritive ratio of 1:5·4 or 1 lb. of digestible nitrogenous matter to 5·4 lb. of carbohydrate matter. A productive ration, to produce meat, milk, and other products, ranges from 1:4 to 1:7. A maintenance ration simply to keep an animal alive ranges from 1:12 to 1:15.

The following daily rations will be found suitable for cows in milk:—

		Dry Matter.	Protein.	Carbo-hydrates.	Fats.	Nutritive Ratio.
1.	15 lb. lucerne hay ..	13·24	1·14	5·67	·195	..
	5 lb. wheaten chaff ..	4·10	·18	2·30	·055	..
	6 lb. bran	5·28	·75	2·64	·17	..
	2 lb. corn meal ..	1·72	·14	1·32	·07	..
	Totals	24·34	2·21	11·93	·490	1 : 5·9
2.	40 lb. silage	10·0	·52	5·4	·24	..
	8 lb. lucerne hay ..	7·12	·99	2·97	·12	..
	2 lb. linseed meal ..	1·78	·52	·77	·13	..
	Totals	18·90	2·03	9·14	·49	1 : 5
3.	40 lb. silage	10·0	·52	5·4	·24	..
	10 lb. lucerne hay ..	8·9	1·23	3·71	·16	..
	8 lb. bran	7·06	·9	3·38	·2	..
	Totals	25·96	2·65	12·49	·60	1 : 5·2

A maintenance ration for cows not in calf could consist of 40 lb. silage. This would give a nutritive ratio of 1:11·4. Where plenty of grass is available a corresponding reduction may be made in the ration of a cow.

No matter how carefully a ration may be prepared cows will not all respond to it alike. Much depends upon their digestive powers, individuality, breed, capacity for producing milk, and the climate will also have a big influence.

Heavy milkers require a ration containing a larger proportion of digestible albumenoids than cows yielding small quantities of milk.—F. Wilkinson, Senior Dairy Instructor, in "Agricultural Gazette of N.S.W."

A GOOD AUSTRALIAN.

Mr. Philip McKenzie Pitt, who has been a member of the staff of the Queensland Agricultural College since its foundation nearly thirty years ago, retired on long leave on the 20th May. Mr. Pitt is the only officer known to every old boy of the College. No man has won more respect, even affection. A kindly, sympathetic, yet shrewd nature, a man by whom one could set his watch, there are hundreds of men scattered over Australia whose lives are brighter and happier for having known him.

A presentation is about to be made to Mr. Pitt, and all old boys are invited to send immediately subscriptions to the Pitt Presentation Committee, Queensland Agricultural College, Gatton.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1925 AND 1924, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April., 1925.	April., 1924.
North Coast.	In.		In.	In.
Atherton	4·37	24	5·07	1·56
Cairns	12·21	43	9·30	20·38
Cardwell	9·66	52	4·13	11·35
Cooktown	9·14	49	6·64	10·38
Herberton	4·22	38	3·88	1·17
Ingham	8·83	33	2·96	9 77
Innisfail	21·40	44	20·73	18·34
Mossman	10·31	17	11·74	10·85
Townsville	3·81	54	0·04	5·24
Central Coast.				
Ayr	2·86	38	...	5·18
Bowen	2·94	54	0·40	6·51
Charters Towers ...	1·75	43	...	2 54
Mackay	6·76	54	1·61	7·62
Proserpine	6·60	22	3·01	6·46
St. Lawrence ...	2·83	54	0·68	4·30
South Coast.				
Biggenden	1·86	26	0·35	1·60
Bundaberg	2·93	42	0·56	1·37
Brisbane	3·58	74	0·98	2·67
Childers	2·58	30	0·66	1·59
Crohamhurst ...	5·70	30	2·42	3·22
Esk	2·60	38	0·77	1·94
Gayndah	1·33	54	...	1·04
Gympie	3·17	55	1·17	3·03
Caboolture	3·98	38	0·94	2·66
Kilkivan	2·07	46	0·04	2·45
Maryborough ...	3·43	53	1·72	2·54

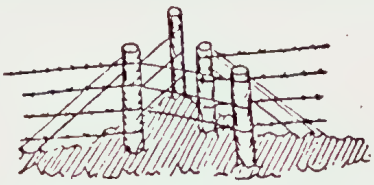
Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April., 1925.	April., 1924.
South Coast—continued:	In.		In.	In.
Nambour	5·43	29	4·07	4·88
Nanango	1·80	43	0·23	0·55
Rockhampton ...	2·33	38	0·19	4·71
Woodford	4·16	38	2·05	2·23
Darling Downs.				
Dalby	1·21	55	0·04	1·20
Emu Vale	1·19	29	0·08	2·47
Jimbour	1·23	37	...	0·96
Miles	1·33	40	...	0 21
Stanthorpe ...	1·66	52	0·29	1·39
Toowoomba ...	2·42	53	0·31	1·73
Warwick	1·62	60	...	2·32
Maranoa.				
Roma	1·25	51	...	1·50
State Farms, &c.				
Bungeworgorai ...	0·85	11	...	1·48
Gatton College ...	1·59	26	0·10	1·58
Gindie	1·18	26	...	1·02
Hermitage ...	1·21	19	..	2·01
Kairi	5·13	10	5·34	2·47
Sugar Experiment Station, Mackay	5·29	28	1·69	6·47
Warren	1·43	11	...	2·77

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

A GATELESS OPENING.

In many places it is desirable to have an opening in the fence that a man can easily slip through without bothering with a gate, but through which horses or cows cannot pass. Four posts are set as shown—two in the fence line, which should be braced, and one on each side of one of the centre-line posts. Branch wires are carried from the other centre-line post to the two side posts. These should be made

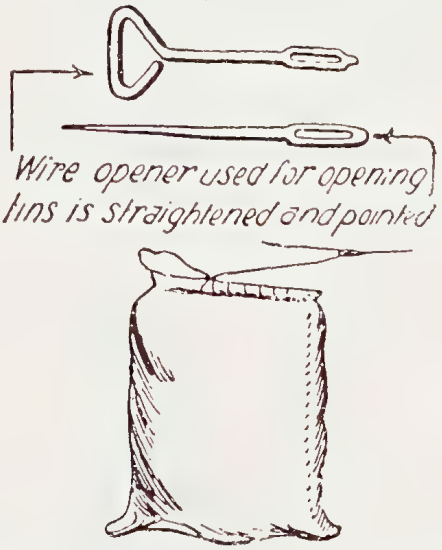


of wire without barbs to catch on the clothes, as it is not desirable to make the openings larger than necessary. If the centre posts are long enough—say, 5½ or 6 ft. above the ground—they can be braced to each other by a piece of strap iron across the top. If this is possible, then the other braces will not be necessary.—"Country Gentleman."

General Notes.

Handy Bag Needle.

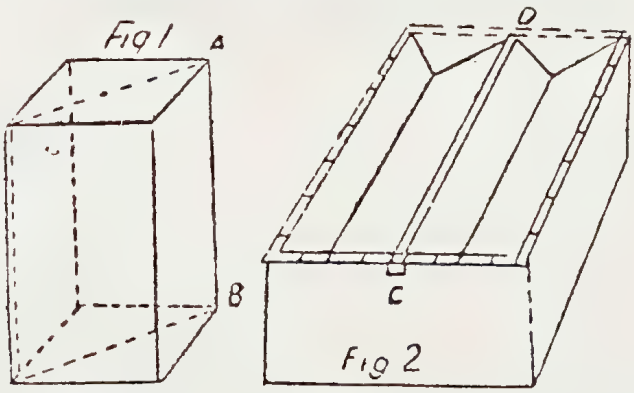
A bodkin or needle suitable for use with string or twine can be readily made from one of the openers that are used to open tin containers. The wire-opener is straightened out and the ends rounded up with a file or on the grindstone, that they



may pass freely through the open weave of the sacking. This simple modification is so easy that a few of the openers can be put aside until such time as the bodkins are needed, when one or more may be straightened up and pointed for use.

A Handy Trough for Pigs.

A very handy trough for feeding pigs or calves can be made out of a kerosene tin. The tin should be cut diagonally (as shown in Fig. 1), leaving the edge AB uncut, and then opened out, forming two wedge-shaped troughs side by side. A box frame should be made of the right dimensions to hold these troughs, and a centre piece let in on the upper edge CD (Fig. 2). The uncut edge of the tin must be placed over CD, the troughs lying on each side of the box frame. By cutting a nick at each corner the edge of the tin is bent over the edge of the box and tacked down.



This class of trough is much to be preferred to wooden or small log troughs or old fruit-case or butter-box troughs, for the reason that it is more permanent and can be scalded out daily, and thus be kept in a clean sanitary condition. If the trough is affixed to a wide board or floor, say, 3 ft. square, it will be impossible for young pigs to upset its contents, and if moved on to a fresh site occasionally will be found exceptionally handy, particularly in wet weather.—E. J. SHELTON, Instructor in Pig Raising.

Virus by 'Plane.

Another of the many boons of our established aerial service has been brought under notice (writes a North Western correspondent). The Stock Department in the course of the past few weeks has been in the habit of forwarding 2,000 doses of natural virus weekly from Townsville to Brunette. This is conveyed by aeroplane from Townsville, a distance of about 900 miles, the whole distance in cold storage. The total consignment will be 12,000 doses, and the benefit of being able to procure natural fresh virus is of wonderful advantage to cattle men in this part of the State.

Feed Value of Damaged Grain.

Shrunken and damaged grain has a relatively low market value, but for feeding purposes (writes the chemist of the Department of Agriculture, New South Wales) it may be nearly equal to the plump sound grain, which commands the higher price. Pinched or shrivelled wheat grains contain, as a rule, a slightly higher percentage of proteins than the plumper grains, and are for this reason a valuable food for poultry.

The feeding value of grain that is "shot" will depend on how far germination has proceeded. A bleached and "shot" sample was lately submitted to the Department with the question whether it was suitable for poultry food, and the reply was that though it would not have the same food value as sound wheat, it was unlikely to have any deleterious effect on poultry.

Cleansing of Milking Machines—An Improved Method.

An article in the New Zealand "Journal of Agriculture" advocates a method of cleansing milking machines which does away with the scrapers and spiral hair-brushes that so damage the inner surfaces of the rubbers. The following are essential to the method:—(1) A suitable plant for boiling water; (2) a stock of caustic soda; (3) an ample supply of clean water; (4) some scrubbing brushes, large buckets, a suitable bath or tub, and a ball of horsehair. The procedure recommended is as follows:—

(1) Before milking, draw cold water through all milk-tubes and the releaser, so as to prevent the adhesion of milk to the pipes, &c.

(2) Immediately after milking wash all dirt off the outside of the teat-cups and rubbers; then draw through each set of teat-cups sufficient cold (or preferably lukewarm) water to flush out the milk system. When drawing the water through the set farthest from the releaser insert a ball of horsehair in the end of the milk-pipe, to cause it to travel through to the releaser with the water.

(3) Next, draw through each set of teat-cups not less than 1 gallon of boiling water, to which caustic soda has been added at the rate of not less than 1 to 1½ tablespoons per 4 gallons of boiling water. Distribute the solution as evenly as possible through each set of teat-cups.

(4) Immediately follow by flushing out the caustic soda solution with 2 gallons of hot water or 1 gallon of boiling water for each set of teat-cups. The flushing with boiling water helps to dry the rubbers, and leaves the milk system dry and sweet.

(5) Then remove or open the plug or flap from the releaser-pipe, to allow of free circulation of air.

(6) Next clean the vacuum system in the same manner as the milk system, by drawing through first the caustic-soda solution, and next the boiling water which has been circulated through the milk system. Pay particular attention to the cleaning of the pipe connecting the releaser to the vacuum tank, by flooding the releaser to cause the water to travel through to the vacuum tank. This is important.

(7) The engine can now be stopped. Disconnect the two long rubbers from downpipes and teat-cups, and hang in a clean, airy place out of the sun.

(8) Next disconnect the releaser, wash, rinse, and place in a clean, dry, sunny place; then disconnect the top or bottom half of the vacuum tank and treat in a similar manner.

To ensure effective cleansing by this method it is essential that it be carried out daily in the manner directed.

Oat Smut—Method of Prevention.

When only a few smutted plants appear in a crop of oats the yield is not affected to an extent which would justify seed treatment. If 5 per cent. or more infected plants occur in the crop, however, the grower is well advised to treat the grain saved from such a crop for seeding purposes.

"Oat smut" can be prevented by pickling the seed. On account of the structure of the oat, formalin has proved to be the most effective fungicide for this purpose. The grain should be dipped for ten minutes in a solution of formalin made up at the rate of 1 pint of formalin to 40 gallons of water. It should then be sown within a period of twenty-four hours from the time of treatment.

Every care should be taken to measure the quantities of solution required, and to see that the grain is not treated for too long a period, or left too long before sowing. It is better to sow such seed moist, rather than allow it to dry. The treated grain should not be placed in dirty bags or it may become reinfected.

Formalin injury occurs especially when the treated grain is sown in a dry seed-bed. Seed injury may be lessened by following the formalin pickle by treatment in lime water (1 lb. lime to 10 gallons water) prior to sowing.

Pasture Improvement.

Now that the values of sheep are higher than has been the case for many years, and as the production of high quality wool and early maturing lambs is receiving considerably more attention than formerly, pastoralists and farmers are paying greater attention to the valuable work of pasture improvement. A summary of the result of experiments (at some fifteen well-distributed centres) comprises a valuable article in the current "Agricultural Gazette" of New South Wales.

The plants which respond most readily to the application of fertilisers are the rapid growing succulent plants, such as clovers, some of the native grasses, and most of the succulent introduced grasses. While some of the native grasses, such as the various species of Star (or Windmill), Panic, and Wallaby respond to the fertiliser, others, such as the spear and Three-awned Spear grasses do not.

The results show that light dressings of superphosphate in dry localities gave the best all-round results, and being comparatively cheap, this is considered one of the most economical fertilisers to use. In these districts the fertiliser should be applied in April or May in order that the herbage may receive the full benefit of the application.

For summer pastures in cold localities it is recommended that the fertiliser be applied in July, while for winter grasses and clovers, such as Toowoomba Canary, Tall Oat, Cocksfoot, Perennial Rye, and the perennial forms of red clover, application should be made in March.

Among the conclusions drawn from these experiments are the following:—

The top-dressing of pastures in most parts of the State is a profitable procedure, resulting in improvement in the quantity and quality of the pastures.

Small quantities of superphosphate of 56 lb. per acre are sufficient in the drier parts of the State, whereas in districts of good rainfall the quantity may be increased.

The residual effect of an application of superphosphate may often be seen for several years.

In coastal districts basic superphosphate has given slightly better results than the more usual form.

Stock evidently do better on top-dressed areas, as they put on more condition and show preference for such areas over untreated sections.

Worn-out pastures, such as those at Crookwell and Jamberoo, benefited greatly from top-dressing. In these two cases the owners intended to plough up and replant, but now the grasses have thickened up to such an extent that replanting is unnecessary.

Weeds disappeared in top-dressed pastures, the vigorous growth of the grasses assisting in choking out detrimental plants.

Top-dressed areas remain green for a longer period, than unmanured sections, thus providing succulent feed for a longer period, and diminishing the danger of bush fires.

Where pastures are poor and thin, stock have to travel over large areas, tracks are worn, and plants destroyed, and animals lose their condition, whereas succulent pastures produce contentment, and animals fatten rapidly.

Worn-out paspalum pastures can be improved by ploughing and sowing seed of suitable plants, and top-dressing. Where it is impossible to plough, a top-dressing of 2 cwt. basic superphosphate applied during the late winter is recommended.

Capacity Production.

Although every attention be given to the working of the soil, it will be found insufficient to make available the large quantities of plant-food required for constant crop production without the aid of fertilisers or manures. No amount of manuring on the other hand will produce good crops if the land is not well tilled. Fertility may be said to depend on a happy combination of the two factors.

Gypsum—Its Use as a Soil Improver.

Gypsum is a naturally occurring lime compound, forming rock masses or deposits consisting of more or less pure sulphate of lime. Unlike other forms of lime, it has no action in sweetening sour soils, but it is of great value in lands which are charged with alkali or irrigated by alkaline water. Its action consists in neutralising the carbonate of soda, which renders the soil or water alkaline or caustic, and converting it into sulphate of soda—a salt which, not being caustic, has not the same injurious effect on the soil or the crops as the original alkali had.

Gypsum, either in a raw or calcined condition, is used in many industries. The following are among the most important of its uses:—(*a*) Fertiliser; (*b*) flux in smelting (particularly for nickel ores); (*c*) paint manufacture; (*d*) as a filler in cotton and paper manufacture; (*e*) as a possible source of sulphur in the manufacture of sulphuric acid; (*f*) for the manufacture of Portland cement, small quantities of gypsum varying from 1½ to 3 per cent. being added to retard setting; (*g*) for the manufacture of plaster of paris.

The ameliorative effect of gypsum on the condition of certain New South Wales soils is interestingly discussed in the course of an article in the current "Agricultural Gazette" of New South Wales. The use of gypsum on the Yanco Irrigation Area, it is stated, has greatly increased in recent years, settlers on the heavy soils especially realising the benefits to be obtained from its use. Soil improvement experiments, using gypsum and lime at various rates of application, and also applications in conjunction with green manuring, have been conducted at Leeton over the last three years, plots of land planted with fruit trees being selected on two local farms for the trial. In both cases, and especially in one, the land was very stiff and hard to work. The surface soil was very shallow, overlying a heavy, practically impervious red clay. The land literally defied permeation by water to any depth, water applied lying on the surface after irrigation for some days, while almost immediately the land was dry enough to carry horses it became so hard that cultivation was almost impracticable, and, if delayed a day, impossible.

It has now been found that after the use gypsum on the land the the soil takes up more water, which under equal conditions moves much faster over the untreated than over the treated areas, owing to more water being absorbed by the latter and the soaking being to a greater depth. After irrigation is completed it is found that the treated plots are ready for cultivation, and will carry the teams one or often two days before the untreated plots, and the soil works up in much better condition, being more friable and mellow.

On examination of the experiment plots on one of the farms on 1st August, 1924, it was noted when holes were dug in the various sections that the section treated with gypsum showed an appreciable effect to a depth of 18 inches, and the section treated with lime to a depth of 12 inches. In each of the untreated sections the soil was hard and dry, while in the dressed portions it was mellow and friable, and crumbled at once to a depth of 18 inches. The subsoil, too, in the dressed sections carried plenty of moisture.

The ordinary wheat drill with a fertiliser attachment is not very satisfactory for the application of gypsum, as the substance is not of a free-running nature, and on the area referred to the use of a shovel is usually resorted to. Special machines for the distribution of lime give satisfactory results when gypsum is used. It has been found that spreading on the surface gives better results than than ploughing under.

Besides being costly, heavy dressings do not appear to be necessary, for lighter applications have so far given equally beneficial results. In both cases if further dressings are given the results will be greater. A dressing of 1 ton per acre is recommended for the heaviest lands of the Area, followed up by applications of half a ton annually. Even when only the half-ton has been given the first year, satisfactory results have been obtained.

The article cautions the reader against regarding gypsum with a too sanguine eye. "The farmer should not allow himself to spoil his land first by injudicious waterings, by the use of too much water, by lack of cultivation, or by permitting stock on the land while it is wet. To resort then to the use of gypsum to remedy matters is to court disappointment. Careful farming right from the start is necessary, and the gypsum must be used not as a 'cure-all,' but in conjunction with green manuring and good and thorough cultivation."

Tractor School at Gatton.

Marked enthusiasm was shown by the seventy-four farmers who attended the recent tractor school held at the Queensland Agricultural High School and College, Gatton. Farmers representing the majority of Queensland's agricultural districts, from Tolga in the North to Canungra on the South Coast, were present. The wheat areas provided a large quota. It was primarily due to the representations of some of the Downs branches of the Local Producers' Association that the school was held at Easter. The Council of Agriculture co-operated with the tractor agents and the Department of Public Instruction in making school arrangements. The course opened on 7th April, and consisted of lectures and practical work, equal periods being devoted to each. The majority of lectures dealt with tractors and tractor operation. Several lectures were given on crops and cultivation, manures, and other items of general interest to the farmer. The practical side consisted of the manipulation of tractors, timing of ignition, valve grinding, &c. In order that students might obtain a working knowledge of each tractor, they were divided into groups of eight, each group operating a different make of tractor each day. The ready co-operation of the tractor agents in this venture was a pleasing feature of the school. The agents, beside sending their tractors, provided mechanics and demonstrators to instruct in driving. There was an entire absence of the competitive spirit. Farmers are quick to see the benefit derived from these courses of instruction. They bring the man on the land into contact with many varieties of tractors under working conditions giving an opportunity of learning how to care for a tractor, how to operate it with understanding and to make field repairs. The farmers and mechanics lived at the college, occupying the rooms of students absent on their Easter vacation.

Wheat and Fat Lambs—The Winter Fodder Problems.

The cultivation of fodder crops for the winter and spring, when natural pastures are usually at a standstill, has not received the attention from the mixed farmer in the past that it warrants. A report of winter fodder trials on farmers' experiment plots in the central west of New South Wales in the current "Agricultural Gazette" of New South Wales is especially interesting.

Now that sheep are recognised as a necessary adjunct to the wheat farm, considerable interest is being taken in the question of fodder supply. The prevalence of fungous diseases in wheat is leading to a change in farming practice, the necessity for systematic rotation in an endeavour to starve out these diseases becoming more realised each year. In view of this change of practice, some definite lines should be adopted by farmers in regard to their sheep. Keeping a few nondescript ewes or wethers just for cleaning weed growth on the fallows is not sufficient, nor is it satisfactory to run a pure line of merinos for their wool, because of the earth which gets into the wool when grazing on cultivated paddocks. The system which appears the most lucrative and easy of adoption in conjunction with wheat-growing is fat-lamb raising. Moreover, it is the one for which a considerable area of the central west is ideally adapted.

Intimately associated with the production of fat lambs is the growing of green fodder crops for winter and early spring. To secure a maximum lambing, strong lambs, and the minimum of trouble with the ewes, it is essential to have such crops on which to run the ewes some time prior to and during lambing. It is just as important to have the right class of feed on which to run ewes and lambs, so that the latter will not be stunted, but can be marketed in the pink of condition and with the much-desired "bloom" upon them.

The experiments have proved conclusively the necessity of winter fodders for all classes of stock, and that they provide an excellent rotation with wheat on the mixed farm.

In the control of fungous diseases the system of rotating wheat with winter fodder crops of barley or oats has proved an excellent one. In this particular oats are the most beneficial. Owing to the early maturing varieties which have been produced in late years—*e.g.*, Sunrise, Mulga, and Lachlan—it is possible they will largely supplant the barleys as winter fodder crops. Barley is much more exacting in its soil and water requirements than oats, and does not provide any bulk of feed in the second growth. If the feed is not required for some time after grazing, the oat paddock may be shut up, and will produce a payable hay crop. Winter fodders should be sown systematically each year. Should the paddocks not be required for grazing, owing to abundance of natural pasture, the crop may profitably be preserved in the form of silage. This is the best insurance against the drought which is bound to come sooner or later.

Where conditions are favourable more mixed farmers should be going in for fat lamb raising. The industry, for which a profitable and steady market exists, appears the most suitable for the wheat farmer, who, by rotating in a systematic manner his wheat and winter fodder crops, is able to produce succulent fodder when he most requires it, and not at the expense of the wheat crop.

How Savings Grow.

The issue of money boxes by the Commonwealth Bank is a comparatively recent institution, but the following figures indicate how popular this branch of the Bank's service has already become:—

During the year ended June, 1924, the Bank sold 119,694 money boxes throughout Australia, and of those returned full the contents averaged £2 3s. 10d. a box, a new box being given free in each case.

The money boxes are attractive replicas of the Bank's head office in Sydney, and are proving a fine incentive to youngsters to cultivate the thrift habit.

Give Children Honey.

Professor Cook says: "We all know how children long for candy. This longing voices a need, and is another evidence of the necessity for sugar in our diet. . . . Children should be given all the honey at each meal time that they will eat. It is safer, will largely do away with the inordinate longing for candy and other sweets, and in lessening the desire doubtless diminishes the amount of cane sugar eaten."

Ask the average child whether he will have honey alone on his bread, or butter alone, and almost invariably he will promptly answer, "Honey." Yet seldom are the needs or the tastes of the child properly consulted. The old man craves fat meat; the child loathes it. He wants sweets, not fat. He delights to eat honey. It is a wholesome food for him, and is not expensive. Why should he not have it?—"Agricultural Journal," British Columbia.

Corned Meat Liquid in a Fowl Yard.

A Goulburn resident with a small yard of poultry utilised the liquid in which corned meat had been boiled the previous evening to feed his fowls. Next morning thirty-one out of the thirty-six fowls were dead or dying.

There was no doubt, replied the poultry expert, that the corned meat water was the cause of the deaths. Any excess of salt, or even small particles of salt, coming in contact with the lining membrane of the bird's crop was likely to cause mortality among fowls or chickens.

At the same time, salt is necessary in their food, and it should be used at the rate of 1 oz. to each 5 lb. of wet mash; the salt should be dissolved in the water used for mixing the mash. If dry mash is fed, only about half the quantity is advisable. This should be finely powdered and thoroughly mixed through the ingredients of the mash.—"Agricultural Gazette" of New South Wales.

Curing the Lemon.

The fruit must be picked carefully—not handled like potatoes, but more after the manner of handling eggs—as decay is liable to set up in any bruised part. The fruit should be stored away in well-ventilated, dry, cool buildings, either in boxes or trays. It is always easier to store small than large quantities; therefore, the larger the quantity the more careful the grower will have to be about the building in which he keeps his fruit. A small closed room may be a capital place in which to keep a few lemons, but, perhaps, not at all suitable if the room is filled with fruit. We neither want the lemon to sweat, nor do we want it to shrivel, and if we can strike the happy medium we are on the right track. It has been demonstrated, both here and in California, that lemons keep best when cut just as they are beginning to turn ripe, and that, on the contrary, they do not keep so well when allowed to hang until quite ripe. They are best cut as soon as they are about 2½ in. in diameter. When they are over 2¾ in. they are over size, except for making lemon peel, when a good thick-skinned 3-in. lemon suits admirably. But we are now talking of lemons for curing, and for this purpose they should be picked when they attain the proper size, even though almost green. They should be allowed to stand for a few days, and then packed away in paper-lined boxes, which may be stacked in blocks in such a manner as to permit a free circulation of air around each case.

The lemons should be cut off (not pulled) in such a way as to leave a small portion of the stalk adhering to the fruit.—W. J. ALLEN, in "Agricultural Gazette" of New South Wales.

Arrowroot Board.

Mr. A. Clark, of Pimpama, and Mr. F. M. Ruskin, of Zillmere, have been appointed chairman and representative of the Council of Agriculture respectively, on the Arrowroot Board, until the 9th March, 1926.

Atherton Tableland Maize Board.

Mr. H. H. Collins, of Atherton, and Mr. J. Brunskill, have been appointed chairman and representative of the Council of Agriculture respectively, on the Atherton Tableland Maize Board, until the 31st March, 1926.

Butter Board.

Messrs. J. L. Wilson, Gladstone; J. T. Mulcahy, Nanango; J. Purcell, Toowoomba; C. H. Jamieson, Tent Hill, Gatton; and T. F. Plunkett, Beau-Pare, Beaudesert, have been appointed as representatives of the growers of butter to the Butter Board as from the 28th April, 1925, to the 27th April, 1926.

The Nightly Challenge of Chanticleer.

Can anything be done to prevent a rooster from crowing during the night?

On the assumption that a bird cannot crow without lifting its head, wire netting is sometimes stretched just over the perches at a height that will allow the birds to get on the perches, but will not allow the cock to crane his neck to crow.

Group Organisation in Agriculture.

The year 1924 will, no doubt, be remembered as a good one. A heavy clip of wool has been produced and a bountiful wheat crop is now being garnered, with satisfactory prices ruling for these and most primary products. But have we done anything to help in this direction? Might we not as easily have been faced with the problem of good returns and poor prices?

The producers have always left the marketing side of their business to chance. It has been a case of "Go your hardest, produce what you can, and trust to luck as to whether it can be sold at remunerative prices." Is it not time we gave the marketing problem very serious thought? I would suggest that the subject be given first place on our programme for the coming year. With the exception of agriculture, practically all commerce and industry is organised on a group capital, group production, and group distribution basis. We may find it difficult or even impracticable to attain to the same high degree of efficient organisation as that enjoyed by some of the other industries, but there is no reason why with more comprehensive organisation and co-operative effort we should not be able to control agriculture in nearly the same way as manufacturers control manufactures. I feel sure the realisation of this can and will be brought about by the various means of co-operative activity provided for under the Co-operation, Community Settlement, and Credit Act.—W. E. Tayler, chairman, Advisory Council, in a recent issue of "Agricultural Bureau Record" (N.S.W.).

Maize for Silage—Southern Enterprise.

Tilba (New South Wales) has already made a name for itself among Southern dairying districts by its progress in the building of silos and by the comparatively advanced methods of feeding dairy cows that are practised. It has now enhanced its reputation as a progressive centre by its agricultural society being the first in the coastal districts of New South Wales to organise a field maize competition for the heaviest yield of the best quality of green fodder or silage maize, and incidentally, by means of the judging, to have the methods of cultivation and general practices in growing the fodder crops assessed with a view to their possible improvement.

With such a worthy object, the Tilba Agricultural, Pastoral, and Horticultural Society departed from the plan of crop-growing competitions previously obtaining, which judged on yield alone, and merely served to bring out as the winner the fortunate individual who possessed the richest soil and grew the heaviest crop, regardless of methods, costs, and quality of crop. The present competition was organised by the society mainly for its educational value, and the New South Wales Department of Agriculture was asked to suggest a score card or scale of points for use in the judging of the crops which would, in addition to points for yield, give credit for cultivation methods, excellence of stand, absence of weed growth, quality

of fodder, freedom from insect pests and diseases, and other characters generally influenced by good farming methods. The educational value of the competition was enhanced by the society requesting the services of a field officer of the Department to act as judge.

The season generally was not as favourable as it might have been, being very dry right up till the end of December, and then setting in very wet. In fact, when the dry season broke the weather was so inordinately cool and wet that the crops matured very slowly, and the task of keeping down weeds was made rather onerous and difficult. These conditions did not favour a heavy entry in the competition, many farmers withdrawing their projected entries because they did not care for only moderate crops to be seen or because they were somewhat over-conscious of the weed growth which was present in their crops.

It was desired that the crops should be judged before the Tilba Show in February, and it was unfortunate that the cool season had so delayed the maturity of the crops that not only was the estimation of the yield of fodder more difficult at that time, but it was also harder to determine the condition and character of the fodder than it would have been at the ensilage stage, which was three or four weeks off still in many of the crops. Under ordinary circumstances, with a normal season, the crops would have been near the best ensiling stage, and the judging would have been easier.

Despite the partly unfavourable season, some surprisingly good crops were seen. It was generally agreed that the season showed definitely that maize crops, even fodder crops, can get too much rain during their growth, for the crops in the district the previous year, with less rainfall, were very much better. It is doubtful, however, whether with all the rainfall there would have been an excess if the accompanying weather had been warmer, and had facilitated the drying of the ground and enabled better cultivation to have been given to keep down the weed growth. A factor not to be overlooked is that the dry winter and spring, combined with cultivation methods which generally did not turn these conditions to the best account, did not give the crop a good start, without which no crop will attain its best growth.

The winning crop (118 points) was grown on drained swamp land which is in the stage of getting over its objectionable excess of peatiness on the surface by cultivation. The yield of the best crop here—two crops were entered, the other scoring 110 points, and securing second place—was estimated at 45 tons per acre, equalling the authentic record yield of green fodder maize for the State, which was also obtained at Tilba several years ago. Although estimated at 45 tons, it is considered that this crop would go even heavier by the time it reached the ensilage stage, as at the time of judging the cobs had not developed very greatly. The heavy yield of green fodder on this class of land in such a season draws attention to the possibility of draining and utilising further swamp areas in this district.

The crop was one of the finest crops of fodder maize ever seen in the State, and its success in this competition was due to its general excellence in yield, character, and appearance, combined with praiseworthy methods of cultivation and attention.

The yields of 25 tons per acre obtained on hill soils of igneous derivation were very creditable. With better methods of cultivation, and the application of methods to increase the soil fertility to make heavier yielding crops, the indications are that some of the crops on the hill slopes in the Tilba district will yet go nearer winning a competition of this kind and incidentally demonstrate not only the capacity but the excellence of these soils under good treatment.

The means by which the fertility of the hill soils in the Tilba district may be maintained or improved are the subject of particular discussion in the report from which these paragraphs have been extracted.

The following improved score card, as recommended for future competitions, will doubtless prove of interest to agricultural organisations generally:—

	Points.
Germination	10
Cultivation methods	25
Freedom from weeds	15
Leafiness and production of ears	15
Character of fodder	10
General appearance, evenness, &c.	10
Absence of insect pests and disease	10
Estimated yield (one point for each ton per acre of green fodder).	

The Cotton Industry.

The Minister for Agriculture (Mr. W. Forgan Smith, M.L.A.) stated recently that he received some time ago a deputation from representatives of the cotton industry, who asked whether the State Government would agree to support a request to the Commonwealth Government that a bounty be paid to the cotton industry. This request also involved State de-control of the industry. Mr. Smith informed the deputation that he would consider the matter provided that the growers themselves intimated that the new proposal was approved by them, and to this end the Minister suggested that a vote be taken of the growers through the Local Producers' Associations concerned. Continuing, the Minister said that on 6th May a further deputation representing the industry waited on him, and informed him that 151 Local Producers' Associations had voted on the proposal, and of this number only 15 were for the negative. The subject was considered by the Cabinet on the 12th May, and it decided to support the growers' request to the Commonwealth Government that the industry be paid a bounty with a view to establishing it on a sound footing. "This means," added Mr. Smith, "that if the Commonwealth agree—and I am given to understand it is favourably disposed towards the proposal—the State will de-control the cotton industry, and the Department's activities will be confined to that assistance which is given to general agriculture."

Staff Changes and Appointments.

The appointments of Messrs. R. L. Prest, H. St. J. Pratt, F. L. Jardine, and S. E. Stephens, as inspectors under the Diseases in Plants Acts, have been confirmed as from the 20th September, 1924.

The officer in charge of police at Mareeba has been appointed an acting inspector of stock.

Mr. Robert Veitch, B.Sc., now of Lautoka, Fiji Islands, has been appointed Chief Entomologist to the Department of Agriculture and Stock in succession to Mr. Henry Tryon, who is approaching the retiring age from the service. Mr. Veitch was born in Edinburgh in 1890, and was educated at the University of Edinburgh, the Imperial College of Science, London, and on the Continent of Europe. In the course of a distinguished University career, he was awarded a number of medals and numerous first-class honours certificates. In 1911 he acted as Demonstrator in Botany to Professor Balfour, and after graduating in 1912, he conducted a Summer School in Forestry and also acted as Zoological Assistant at the Dick Veterinary College. He acted as Assistant Entomologist to the Imperial Bureau of Entomology, British Museum, London, from December, 1912, to March, 1914. In March 1914 he accepted his present position as Entomologist to the Colonial Sugar Refining Company. He was elected a Fellow of the Entomological Society of London in 1914 and of the Linnean Society of New South Wales in 1917.

Officers underlisted have been appointed Cane Testers for the forthcoming sugar season:—

Mr. C. H. Jorgensen, South Johnstone; F. W. Trulson, Babinda; Mr. J. Howard, Mulgrave; Miss C. E. Rowe, Mourilyan; Mr. P. H. Compton, Invicta; Mr. R. J. Rollston, Pioneer; Mr. A. G. Kelly, Kalamia; Miss L. H. Fuller, Inkerman; Mr. P. J. Phelan, Proserpine; Mr. J. Macfie, Farleigh; Miss A. L. Levy, Marian; Mr. F. Jorss, Pleystowe; Miss I. V. Palmer, North Eton; Miss M. T. Smith, Racecourse; Miss I. McGill, Gin Gin; Miss E. Christsen, Plane Creek; Miss D. Marles, Bingera; Mr. C. J. Boast, Millaquin; Miss K. Fauth, Fairymead; Mr. S. C. Bracey, Qunaba; Mrs. K. Dunton, Maryborough; Mr. R. B. May, Moreton; Mr. H. B. Davis, Rocky Point; and Mr. H. Lambert, Mount Bauple.

Messrs. T. Herbert and W. Clacher have been appointed Assistants to Cane Testers at South Johnstone and Proserpine respectively.

Constables J. A. Marr and A. F. Horn, of Evergreen and Canungra, respectively, have been appointed Inspectors of Slaughter-houses.

Mr. T. Welsby, of Brisbane, and Mr. L. H. Maynard, of Bundaberg, have been appointed Officers under and for the purposes of the Animals and Birds Act.

Mr. L. Chadwick has been appointed Cane Tester for the forthcoming season at Cattle Creek Sugar Mill, and Misses S. Riley and F. Parkinson have been appointed Assistants to Cane Testers at Bingera and Inkerman Mills, respectively.

Police Sergeants J. Tuohy and P. W. Cowley, of Innisfail and Charleville, respectively, have been appointed Acting Inspectors of Stock.

The appointment of Mr. Daniel Culhane as Inspector of Dairies and Inspector of Stock, Department of Agriculture and Stock, has now been approved.

Answers to Correspondents.

Questions for reply under this heading should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Horse Ailments.

M.H.M. (Mooloolah)—Mr. Rudd, of the Veterinary Staff, advises:—

This horse is apparently suffering from indigestion. He evidently bolts his food. If his teeth are in good condition feeding on long hay will abate this, and force him to masticate his food thoroughly. If fed daily on 30 lb. of good oaten chaff there is no necessity for the addition of maize to the ration, which should be cracked instead of being fed whole.

Stabling at night and a spell away from work should be tried, as there is little nourishment in natural pasture at this time of the year.

Give the following daily in the food for twenty-one days:—Epsom salts, 1 ounce; nitrate of potash, 1 drachm. It should be mixed in the damped food in the morning.

H.B. (Maroochy River)—Mr. Rudd, of the Veterinary Staff, advises:—

The horse is in all probability a natural shiverer, but this condition may be aggravated by lack of suitable surroundings which accentuates the trouble. The only way to help the animal is to feed him on suitable food and keep him stabled, when in all probability he will do all the work which is required of him without much effort.

Clip him trace high and rug him and stable him at night on good bedding. Feed him on oaten chaff three-quarters and lucerne chaff one-quarter. The combined food being equal to 30 lb. per diem plus that which he can pick up in the paddock when not working.

Give him the following powders at the rate of one tablespoonful per day in his food:—Finely powdered bone meal, 1 lb.; sulphate of magnesia, 3 oz.; powdered gentian, 3 oz.; sulphate of iron, 2 oz.; powdered fenugreek, 3 oz.; salt, 3 oz.

If the horse is given a short spell and built up before being put back to hard work, he will in all probability do the work which is required of him.

Pigs—Their Feeding, Breeding, and Care.

H.F.R. (Eumundi)—

The dry feeding system is practised extensively overseas, but so far we do not, in general, follow this system here, for the reason that skim milk forms a very large proportion of the food given to our pigs, and where concentrated meals—pollard, barley meal, maize meal, &c.—is being fed as a slop or mash. However, the Instructor in Pig Raising, Mr. Shelton, advises that you would be quite safe in feeding any of these meals dry, but for a start it would be preferable to accustom the animals to a drier mash before putting them on the meal alone as the cereal portion of their food. If you gave us an idea of the number of pigs you are feeding and the manner in which you suggested feeding the pigs in the future we could help you.

R.E.G. (Townsville)—The Instructor in Pig Raising (Mr. Shelton) advises:—

The Use of Dried Blood.—The use of this meal should be restricted to the feeding of young and growing pigs. Meat meal is to be preferred to dried blood, as it contains more bulk and in general will give better results. Meat meal can be considered a wholesome addition to the large variety of foods in which there is a shortage of protein; thus in balancing rations containing maize, potatoes, wheat, and other foods that show large percentages of starch and sugar, also percentages of protein, meat meal is a suitable addition to the food. The addition of a quantity of dried blood to meat meal would of course increase its protein content, but in general would also increase its cost prohibitively. Both meat meal and dried blood have lavative qualities, and the use of too heavy a supply results in intestinal disorders. In using dried blood alone no more than 10 per cent. should be added to the food you are already using, for your foods are mostly rich in protein.

Lucerne is considered the king of green fodder for pigs, and its use particularly for breeding sows is strongly recommended, as also is the use of any green foods like vegetable garden waste which the pig will consume, but these foods must be balanced with grains, roots (sweet potatoes, &c.).

A pamphlet containing much information relative to feeding the brood sow prior to and after farrowing has been posted to you.

Giving the sow one 3-ounce dose of castor oil about three days before farrowing date is recommended. The oil should first be mixed in about half a bucketful of dry bran, then thin the rest down to the consistency of thick cream with warm water or milk, and give as the first feed of the day. This has a very beneficial effect on the sow, and will relieve the bowels and ensure her being in good order for farrowing. It is customary to wean the young pigs at eight weeks of age, though in the case of a weakly litter it might be advisable to allow them to run with the sow till ten weeks old.

It is customary to mate the sow one week after weaning the young pigs—*i.e.*, at about nine weeks after farrowing. See reference to this subject in pamphlet.

Care should be taken in feeding waste fruit to pigs, particularly fruit like mangoes, for they have a very laxative effect, and may cause a severe diarrhœa. It is for this reason that sows close to farrowing should have a very limited diet of foods of this description.

Fencing for Pigs.—For paddock use there is nothing better than "K" wire-netting or a special grade of heavy netting like Lysaght's 42-in. high by 2½-in. mesh by 14 or 15 gauge. Your storekeeper could quote you for these materials as well as for the fencing materials, like hardwood palings, which are recommended for subdivision fences in small yards.

The use of a concrete wallow is recommended, particularly for the breeding sows. Particulars as to construction, &c., can be supplied if requested.

Porkers *versus* Baconers.—In general it will be found that it pays better, particularly situated as you are, to market your pigs as porkers than to attempt to carry them on to bacon size; but you will find the butchers at Townsville are accustomed to handling fairly heavy porkers. See them and make arrangements accordingly. You cannot do better than that at present.

Troughing.—Concrete or steel troughs are much to be preferred to wood troughs. Your storekeeper could, no doubt, quote for the most suitable class of steel trough.

Returns per Sow.—The sow should produce two litters per annum, and should rear at least eight pigs per litter. You could ascertain the value of porkers per pound from local butchers. One suburban pig farmer, at Dundas, N.S.W., makes a comfortable living by running twelve sows and selling their progeny as porkers at the Abattoir Sale Yards, Sydney.

Purchases of Berkshire Pigs.—Your best plan would be to write The Manager, State Farm, Warren, *viâ* Rockhampton. He could quote you for unrelated boars and sows crated on rail, Warren, which is 14 miles west of Rockhampton, and you could depend upon the quality and type of any stock he supplies, and the prices are most reasonable. Stud pigs up to six months old are worth at least 6 guineas each. If you secured a boar and two unrelated sows and managed them properly you would find ample sale for the progeny in your own district as breeding stock at very payable prices.

The subject of castration is referred to in the pig pamphlet. Your local butcher could no doubt give you a few useful hints in this subject if you are inexperienced.

We would strongly recommend your visiting any successful farmer in the district within which you reside to study the methods adopted and observe the general procedure. Practical experience gained in this way, combined with the information you have or can obtain, should enable you to carry on successfully.

Testing Pigs for Tuberculosis.

A correspondent writes:—"Is it possible to test pigs for tuberculosis in the same way as cattle are tested, and if so what is the procedure and what symptoms would indicate the presence of disease or otherwise? Are tests of this description efficacious; what would be the cost of the instruments and vaccine; where can these be procured, and can the test be carried out by a layman or would it be necessary to employ the services of the stock inspector or veterinary surgeon?"

The Veterinary Branch advises that it is possible to test pigs for tuberculosis. The method applied is the eye test, which should be carried out by a qualified veterinary surgeon. The symptoms are inflammation of the eye with a discharge of pus. The average pig's life is so short that this test is seldom or never applied. Instruments are not required for this test. Tuberculin is prepared by Park, Davis, and Co., Sydney, for this operation, and full instructions as to use are sent with each order.

Pigs as a rule contract the disease through being fed on tuberculous milk, and it is therefore advised that if tuberculosis is found in pigs after slaughter the whole herd of cows should be tested, which will be done free of charge on making application to the Chief Inspector of Stock, Brisbane. Cattle reacting to the test must be destroyed.

Pig Feeding.

R.J.R. (Ubobo)—

The secret of success in feeding pigs, says Mr. Shelton, Inspector in Pig Raising, lies in the production on the farm of as much of the food as possible. This is why we advocate the growing of such crops as lucerne, rape, artichokes, sweet potatoes, pumpkins, and a great variety of others.

Of commercial meals we consider barley meal the best, and as skinless barley is usually available at round three shillings per bushel, it is much cheaper and more efficient than pollard. Oaten pollard can also be used in balancing a ration, but it is not usually possible to purchase oaten pollard in our markets, but it would pay you to approach firms like Burrel, Fenton, and Co., of Roma Street, for quotations.

If you could obtain a supply of small and cracked cow peas and have these ground up, they also would be suitable. You will note from the reference to bran in the pamphlet "Pigs for Profit" that we do not advise the use of this product except in very limited quantities, and then principally for breeding sows, at or prior to the farrowing stage. Skim milk, buttermilk, and whey are of course cheap and efficient units in working up a ration.

For quantities per pig per day see page 54 in the pamphlet on "The Pig Industry," which has been posted to you direct.

"The Kidney Worm," *(Stephanurus Dentatus).*

These worms form cysts, varying in size, and often collected in groups, each cyst usually containing two worms, a male and female. The cysts are commonly found in the fat, in the vicinity of the kidneys, and frequently in different solid organs of the abdomen, such as the kidneys, liver, and spleen. Upon *post-mortem* examination these worms are frequently found in considerable numbers, the pigs during life having shown no signs of disease, but when they are present in the liver or kidneys they are liable to set up serious trouble.

The symptoms exhibited by pigs during life are very problematical, apart from indications of liver or kidney disease. Treatment is extremely unsatisfactory, mainly because the worms are encysted in the solid tissues, so that any medicine introduced by the mouth could not be hoped to reach the worms in a sufficiently concentrated form to kill them. Arsenic, in the form of *Liquor Arsenicalis*, can be given daily for a week, in doses (varying according to age of pigs) of from 15 to 45 drops. This treatment can be repeated after an interval of one week.

Prevention is the only reliable method of dealing with this disease. Pigs should be excluded from all ground known to be infested, or on which infested pigs have been. They should not be fed on offal or flesh of other pigs, including scraps from the kitchen, until such material has been thoroughly cooked. The common feeding trough of the pig is a source of infestment, because the animal can get in not only with his nose but also his feet, filthy from direct contact with the urine and fæces of himself and others. The trough should always have a sloping cover, extending forwards and upwards at an angle of 45 deg. from the posterior border, and which will at least exclude the feet from the food. The trough should further be cleansed and disinfected daily.—Major A. H. CORY M.R.C.V.S., Chief Inspector of Stock.

Farm and Garden Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine, and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early flowering period—*i.e.*, when about one-third of the plants in the crop are in flower.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, holly-hocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

Orchard Notes for July.

THE COASTAL DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated, but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit. This commanded the highest price realised for mandarins last season.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former, and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing, well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before spring growth starts.

In pruning, follow the advice given in the June number; and if you are not thoroughly conversant with the work, get the advice of one or other of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out, it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth, and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime-sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	MAY.		JUNE.		MOONRISE. MAY.	JUNE.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·18	5·20	6·36	5·3	12·45	1·16
2	6·18	5·19	6·36	5·3	1 25	1·50
3	6·19	5·18	6·37	5·3	2 5	2·28
4	6·20	5·17	6 37	5·3	2 42	3·9
5	6·21	5·17	6·38	5·2	3·17	3 53
6	6·22	5·16	6·38	5·2	3·55	4·41
7	6·22	5·16	6·39	5 2	4·34	5·33
8	6·23	5 15	6 39	5·2	5·16	6·32
9	6·23	5·14	6·40	5 2	6 2	7·36
10	6·24	5·14	6·40	5·2	6·53	8·42
11	6·25	5·13	6·41	5·2	7·47	9·48
12	6·25	5·13	6·41	5·2	8·48	10·50
13	6·26	5·12	6·42	5·2	9·52	11·51
14	6·26	5 12	6 42	5·2	10·55	...
					a.m.	
15	6·27	5·11	6·42	5·3	11·58	12·50
16	6·27	5·10	6·42	5·3	a.m.	1·45
17	6·28	5·10	6·42	5·3	12·58	2·42
18	6·28	5·9	6·43	5·3	1·56	3·37
19	6·29	5·9	6·43	5·4	2·53	4·30
20	6·29	5·8	6·43	5·4	3·49	5·25
21	6·30	5·8	6·43	5·4	4·45	6·17
22	6·31	5·7	6·43	5·4	5·41	7 8
23	6·31	5·7	6·43	5·4	6·35	7 56
24	6·32	5·6	6·44	5·4	7 30	8·42
25	6·32	5·6	6·44	5·4	8·21	9·23
26	6·33	5·5	6·44	5 5	9·12	10·2
27	6·33	5·5	6·44	5 5	10·0	10 39
28	6·34	5·4	6·44	5·5	10·43	11·15
29	6·34	5·4	6 44	5 5	11·23	11.49
					p.m.	p.m.
30	6·35	5·3	6·44	5·6	12·2	12·26
31	6·35	5·3	...	...	12·4	...

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

1 May	(	First Quarter	1 20 p.m.
8 „	○	Full Moon	11 43 p.m.
15 „	)	Last Quarter	3 46 p.m.
23 „	●	New Moon	1 48 a.m.
31 „	(	First Quarter	6 4 a.m.

Perigee, 11th May at 11 48 p.m.
Apogee, 27th „ at 7 30 a.m.

THE PLANETS.

Mercury will be at its greatest elongation west of the sun at 9 p.m. on the 16th May, and will therefore be visible in the early mornings in the North Eastern sky.

Venus will be apparently too near the sun to be noticeable during this month.

Both Mars and Neptune will be in conjunction with the moon before the end of the month, but in such positions with regard to the sun as to be practically unobservable.

Jupiter will be stationary on the 11th May at 4 a.m., after which it will apparently move westwards amongst the stars of Sagittarius, till 16th September. On the 15th Jupiter will seem to be very near the moon soon after sunset in the N.W.

Saturn will be in opposition to the sun and at its nearest distance from the earth, about 750 millions of miles, on 1st May. On 8th May it will be in conjunction with the moon about 11 a.m. when it will be two and a half degrees to the southward. When the moon rises it will have advanced about three degrees further east, and the apparent distance between the planet and the moon will be slightly increased.

7 June	○	Full Moon	7 48 a.m.
13 „	)	Last Quarter	10 44 p.m.
21 „	●	New Moon	4 17 p.m.
29 „	(	First Quarter	7 43 p.m.

Perigee, 8th June at 1 54 p.m.
Apogee, 23rd „ at 6 24 p.m.

THE PLANETS.

The Australian Waiter Solstice will occur on the 22nd June when the sun will reach its greatest Northern latitude, and the shortest day will occur. It will be interesting to notice at what points on the horizon it will rise and set.

Mercury will be in superior conjunction with the sun on the 20th June, that is, on the farthest side of its orbit beyond the sun, and therefore invisible for a week or two.

Venus will be still apparently too near the sun to be noticeable.

Mars is getting still lower towards the Western horizon soon after sunset, and becoming less and less noticeable. It will be in conjunction with the moon on the 24th. Jupiter will be in conjunction with the moon on the 9th at 5 p.m., and the two will therefore present an interesting spectacle soon after the moon rises, especially after 8 p.m.

Saturn will be in conjunction with the moon on the 4th at 5.49 p.m., when both will be well above the Eastern horizon.

Royal Botanic Gardens Victoria
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